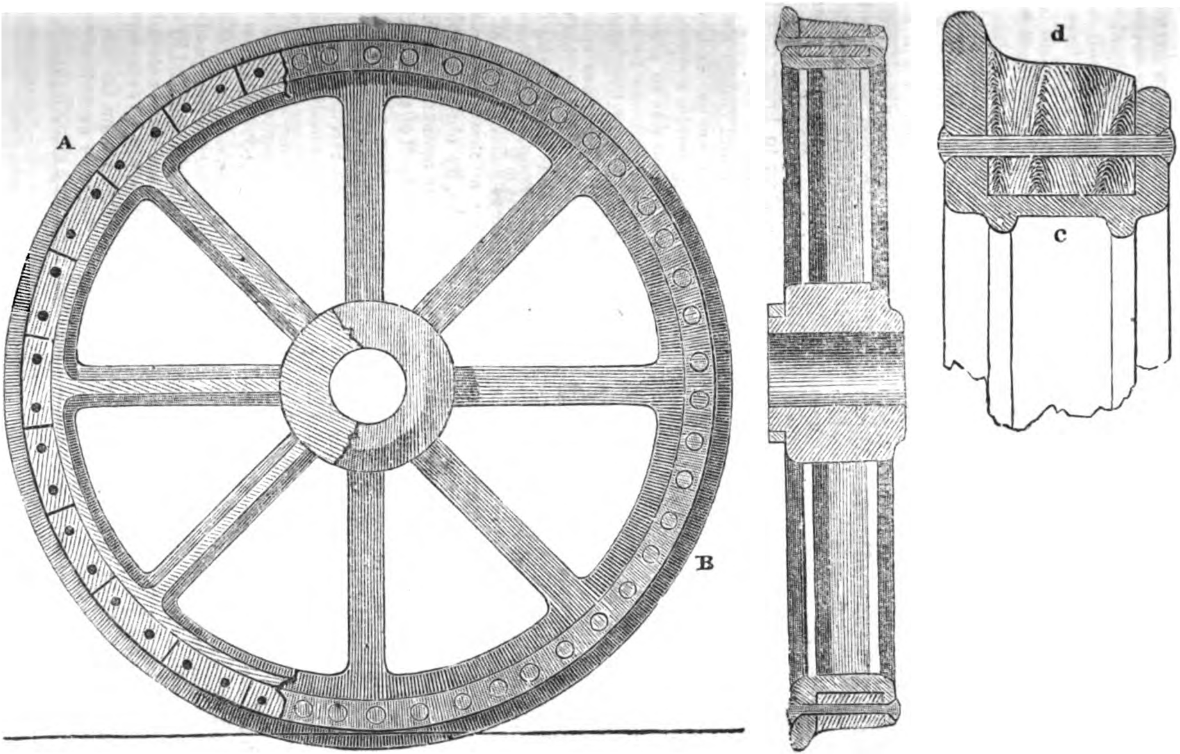
A
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d
c

copied shortly after they had come out, and before the sale of those patterns had remunerated him for the expense of producing them. Finds that the inadequate protection tends most decidedly to prevent the designing of very expensive and elaborate patterns: not only does it prevent the production of such pattern, but he finds it necessary in the working in his trade, to bring out as few original patterns as possible; finds it will not do for him to labour very much to bring out new original patterns, because if he did so, all his patterns would be copied; no person would print with him; therefore he makes up patterns one with another; he brings out a considerable quantity of patterns; he brings out as many patterns as he can, in order to baffle the copier by the variety he brings out. Endeavours to make a trade by variety rather than by excellence. Conceives that the present inadequate protection tends to prevent the application of design to matters to which it would be applied, if a longer term of protection existed. Printed hangings for architectural decorations of rooms have lately been printed in this country, within the last four or five years; has been a good deal engaged in that trade. Some of them are of a high class of art; that is, as high as we dare produce under the existing circumstances; has specimens here which require a great deal of time in their production; they are like class drawing, every defect appears, and you cannot often tell how they will look until they are produced in cloth. Exhibits one which he is unwilling to bring out at present, on account of the expense of blocks; it will take 32 or 35 blocks; he cannot bring it out, it would be copied immediately. Exhibits another pattern which was drawn four times before he could satisfy himself with the effect; this has been executed and sold; it was drawn from nature; drawings of the flowers were supplied to him; it may be imagined that it cost a great deal of money to draw that three or four times over. Should think this pattern cost at least 50*l.* drawing, and in the execution of the blocks, but he was not at the expense of the drawings; the house by whom he was employed supplied him with the designs. The grouping of the flowers was all that was left to his designer, and it was drawn over three or four times before the effect was satisfactory. Thinks his employer paid 20*l.* for the drawings of the flowers, in addition to the 50*l.* spoken of. Has stated that the class of art in the designs just exhibited is as high as he feels warranted in bringing into exercise under the present term of protection; if that term were extended, a higher class of art would be introduced into these manufactures. If he could be favoured with a real protection, giving a sufficient copyright, he would immediately employ artists of the first character; would not be content with persons that they call drawers, or even inferior artists. Has not made any effort towards that, further than by requesting his friend Mr. Sydney Smirke to get him drawings; thinks his father has drawn several, but he has never pleased himself. It was with a view to architectural decorations; with a view to improve the character of hangings, and also pannels for tapestry. These are not at present produced by any English printer that he knows of; they would be produced on woollen cloth. There have not been any attempts made in this country to produce designs of this kind upon pannels for the decoration of rooms. Thinks there is a set of French work to be seen at Pratt's in Bond-street. Thinks that manufacture would be likely to be introduced into this country, if an adequate term of protection was given. Should be disposed to undertake it himself, with proper protection. Had the pleasure of returning from Paris with Sir David Wilkie, who was returning from Italy, and was quite full of the Italian palaces and other things which he had seen, in which it is very common to decorate them with arabesques, and introducing medallions in pannels. They soon became friendly in consequence of this coincidence of feeling, for he had been wishing it for some time; they talked about it a considerable time, and Sir David Wilkie said, that if witness would take it up, he would at any period, and however he might be engaged, make a set of drawings for the purpose. But it would be of no use troubling Sir David Wilkie to forego his lucrative occupation to make drawings that would be immediately copied. The want of protection deters him from making an attempt of the kind; because it would be some time before things of that kind would be sold sufficient to repay the expense. His own idea is, that the copyright of a pattern ought to be the same as the copyright of a book; cannot see any difference between the two things. If he was to produce a beautiful engraving, and publish it as a print, he would have a long term of copyright. His old ideas as a book printer are so mixed up with his present occupation, that he cannot see it in any other point of view. Cannot see why thought is to be protected in one case and not in another. The present limited term of copyright checks any great attempt being made to improve the ordinary objects of the art in its application to designs for manufactures, for the reasons stated—that they cannot go to much expense about any one thing. This has a tendency to keep the designs for those manufactures within a very simple and inartificial class. If they could very much

improve any one article, is satisfied that the trade would increase accordingly; and you have one strong proof of that in the manufacture of pocket handkerchiefs, which, when he entered upon it, was in a very low state, but which has since improved to so great an extent, that now very beautiful things are produced.

The result of his conviction is, that an extended term of copyright would induce a greater outlay of capital in producing elaborate designs, and tend to raise the character of the art generally. Is sure it would in his own case, and thinks it would with others. Cannot possibly imagine that it would have the effect of reducing the extent of trade at present done. He should expect that the more he sowed, the more he should reap; that the more pains he took in producing new and good things, the more likely he would be to be rewarded by the public for his labour and expense. Thinks it exceedingly probable that the effect of introducing a greater variety, or a higher class of art in the home market, would be to cause more dresses to be worn—because, what is a dress after all? It is mere fancy and taste, it is not a mere covering, otherwise we should have never had any printed dresses used at all. It is like paintings, there is no reason why any gentleman, should possess a painting, but when he sees a good one he wishes to have it. Believes it would also have a tendency to extend our export trade, inasmuch as the Americans buy many French things because they think their style better than ours. It would tend to produce an advantageous competition among the designers themselves; it would very much raise the character of the class of persons he employs as designers, and should employ more if he had anything like a real protection. Should be quite easy in incurring the expense, and should not fear embarking greater sums; but where it is limited to three months, a thing no sooner comes out and becomes known, than it is copied. Thinks that the art of printing would be extended into new channels if greater protection were afforded. Thinks that tapestries would be very much printed. Has a set of designs for churches, which he is afraid to execute, for the reasons already stated. He should not venture to do these, (*producing some patterns*) in the present state of the law. Has no idea that any particular improvement could be made in the art of printing, as at present applied, further than that the designs might be bettered. Thinks that several facilities and advantages would be given to the printer in conducting his trade, by extending the term of copyright, and for this reason, that being relieved from the necessity of bringing out so many patterns as mere varieties, he would give more attention and time to patterns. He would then labour to bring out more beautiful and good patterns, and would then gain by his successful patterns. At present if he brings out ten patterns, and one of them succeeds, that pattern would repay for the unsuccessful ones; but the moment they have got a prize, the copier runs away with it, leaving them to pay for all the blanks. Is of opinion that an extended term of copyright would be advantageous to designs, inasmuch as the party who now employs himself in copying would then produce originals, and would share in the protection of the law. Thinks also that if he had sufficient copyright, another party might bargain with him for his design. Supposing, for instance, he had produced a good pattern, and after using it three or four months, he wished to bring it out, it would be open to him to bargain with any party just as an author does with a bookseller for an edition of his works. Has only enjoyed the present three months copyright, a year; because he prints on silk and on chalis, which were for the first time included in Mr. Poulet Thomson's Bill of last year. Is decidedly of opinion that an extension of the term of copyright would increase the number of parties now employed as designers. If he were assured of its being carried into effect he should seek immediately to engage two or three persons he knows. His observations refer to an extension of from three to twelve months, because he is not permitted to think of his own views which go to a greater extent. One strong reason why he should engage more drawers and pay them more liberally, is, that having then more time to sell his goods, he should act with more confidence, and want of confidence is a very bad feature in the present system. He does not buy patterns with any confidence; the draper does not order with any confidence; the retail draper does not buy with any confidence; the lady who buys the dress, does so with the impression that it is hardly worth while to buy it; and by-and-bye, when her servant gets the same thing on, she goes back to the shop and actually reproaches them with having sold her a pattern which is hawked about in a common way. How they manage to get a trade, he hardly knows; it is only by means of exertion. Speaks most feelingly upon the subject, because he has the management of the patterns. He brought out 513 patterns last year in a small London trade; but it is only by means of great exertion they are enabled to make any way at all. If the committee could enter practically into the situation of the London printers, they would see that it is a trade of the most intense anxiety. In making designs he frequently takes ideas from French patterns and also from old English patterns; many of the French patterns he takes entirely; it is part of his system of

trade. Does not consider himself entitled to protection for those copies. His present principle of trade is to bring out as many new patterns as possible. A pattern lasts only a certain time, and it is variety that makes the trade now, rather than excellence. In fact he cannot aim at great excellence because he is copied immediately if he brings out a beautiful pattern. If he had more protection, should try to produce things of superior excellence in point of style to what he does now. Brings out patterns for two periods of the year; viz.: for spring and autumn, but has no particular rule in his fancy trade; he endeavours to keep the men employed all the year round; is not like the great Manchester houses, who have particular days and seasons,—his pattern is cut and printed at once. During the whole of the winter he brings out light chalis, which are used for dinner dresses: but it is the custom of the trade generally to bring out the spring patterns about the latter end of February or the beginning of March. The season is pretty nearly over at the expiration of three months; does not do much business in July. Understands that the Lord Chancellor has declared, that an imitation of any print is not to be commenced till the expiration of three months. Then, taking that it requires a fortnight at least for a copier to bring out any thing, decidely thinks it would not answer any person's purpose to copy a spring pattern at the end of that time; but the extension of the copyright would be very beneficial to witness in this particular; supposing the spring patterns have not been very successful, or supposing there has not been a good trade, if he had the opportunity of putting a ground to them, and bringing them out in the autumn, and so, if he had the opportunity doing the same with the autumn patterns, and bringing them out in the spring, that is a thing he should frequently do if he had longer protection; he can easily change the grounds. The styles produced for the autumn are generally different from those produced for the spring. His observations apply to printing on chalis, not upon calicoes—does not attempt them. The printing of chalis is an article of recent introduction, about six or seven years. Thinks it is increasing very much this year. Is printing a great many more chalis than *mousseline-de-laines*. But thinks this arises from the *mousseline-de-laines* trade being taken to Manchester. The chalis is wool and silk, the *mousseline-de-laine* wool and cotton. Three months is scarcely any protection at all in his trade. As a general principle, the longer the protection, the better it must be for the proprietor of the pattern, and the more opportunity he has of reimbursing himself. Is a good deal driven by the great anxiety existing in the public mind to have a constant succession of novelties. Supposing he shows his customers the same patterns over again, it is a common answer to say, "I have seen this before; I want something new." And he has the same feeling himself; when he goes to town and sees the same things upon the counter, he says, "I must change these." Taking the question generally, these changes are required fully as often as every three or four months; but the copiers take only the best patterns, and what they copy will sometimes run three or four years. He has patterns that have happily escaped them, which he is still working. All the good patterns are not copied, but a great many of them are. Cannot say exactly how many, but thinks he has had 12 out of 60 copied in one season. It may be said this is but a small proportion after all; but they are the best; it is the prizes in the lottery which are taken away. If asked, can there be novelty in a pattern which contains an object taken out of another pattern? Should say certainly yes; there may be. A pattern may be a new pattern, though containing all the objects of another pattern. All the objects may be taken from another pattern, yet they may be very different, quite different enough to be a new pattern. If the combination makes it a new pattern, has no difficulty in saying that he should be entitled to a copyright in it. Considers he has a right to look over his neighbours' patterns, and to make a pattern of his own from the objects and ideas which he finds in his neighbours' pattern; provided that in so doing he does not copy his neighbours' pattern. Has a right to take all his ideas, if, out of those ideas he makes a new pattern. Sees no injustice in any law that allows this appropriation of his neighbours' ideas. If they are made new, his neighbour can have no right in the ideas; ideas are common to all; it is the application and use made of the ideas which gives the copyright. All patterns are made one from another; there are only a few original objects in the world. It may be said, from the vast number of millions of patterns that have been produced, must not those patterns have combined in one shape or another, every pattern that any pattern drawer can conceive at the present time? Should say decidedly not; that is quite contrary to all experience. We find hosts of new patterns coming out continually. Does not consider that copyright of design at all extends to colour; has never so contemplated it. It is entirely limited to the design—to the pattern, and a variation of the colour with the same design would not create originality in any way; the pattern itself must be varied as well as the colouring of the pattern.

Mr. James Stirling resides at Island-bridge, Dublin; is manager of Mr. Henry's calico

print works, who has been 20 years engaged in that trade. Mr. Henry keeps his own staff of designers; there are eight employed at present. The cost of maintaining that establishment of designers, is about 800*l.* a year. He pays his foreman 300*l.* a year; he has others at two guineas a week and some at lower wages. Previous to the passing of Mr. Poulet Thomson's Bill of 1839, there was no prohibition against copying the designs of other persons in Ireland; the Copyright Bill did not extend to Ireland. In addition to the staff of designers kept by Mr. Henry, he was in the habit, before 1839, of copying from other persons; they had rather a bounty for copying in Ireland previous to 1839. When witness first went into the business, eleven years ago, their engravings were all got from England, and the reason was, that the copyright not preventing their getting them immediately upon their being engraved, the engravers would engrave those patterns upon rollers at half the price at which they were engraved for the English printer, so that where he paid 10*l.*, the Irish had it for 5*l.* The engraving of Mr. Henry's designs is performed on his own premises; he keeps his own engravers and cutters. His expenses for wages alone, for engraving copper rollers for 12 months, would be a thousand and some odd pounds, the procuring of tools and other necessaries would amount to 600*l.* more, so that his expense for engraving is 1,615*l.* For block cutting for 12 months the expense has been 760*l.* His expense for block cutting and engraving previous to 1831 was a mere trifle; what he paid for engraving was paid to Manchester. At present the engraving costs about 8*l.* a pattern; formerly he does not think it would average near the half of that sum. So that during the period when Mr. Henry was free from all trammels of copyright protection, and had liberty to copy *ad libitum*, the amount of employment given by him to original designers was to other designers, whereas he now retains eight in his own employment, and the amount which he then paid to engravers did not exceed one-half the amount which he pays at present. So that in coming under a system of protection, he has given additional employment and additional encouragement both to designers and engravers; it has increased the one eight fold, and, he should think three times the other. The law of copyright now extends to Ireland, giving them three months' protection; but conceives that term is worth nothing, it is not adequate to secure a fair remuneration for speculations in designing, and in producing and for the investment of capital. He speaks both of the foreign and the home trade. He should think that six months would afford a protection for the home trade, where the party is printing merely for that, and has no occasion to show his pattern before he makes his delivery; but if he is printing for the export trade, six months would not be any protection to him. Six months would not be a sufficient protection, although the designs printed might be suitable both for the spring and the winter season. Nothing less than 12 months would be a sufficient protection for the foreign trade. Has suffered to a very great extent from having his patterns copied; the copying has been chiefly carried on at Manchester. The copies have generally been designed for the foreign market; is so much engaged in printing for the foreign market, that he designs chiefly for that object, though many patterns are also suitable for the foreign trade. Is now selling to the home trade for spring, patterns that were engraved for the export market in August and September last. They are not protected now, the copyright expired three months ago. Finds producing novelties to be the only thing that will ensure a sale; and it has gone to this extent on account of being so repeatedly copied, that where he was in the habit of taking from export merchants orders for 10, 20, 30, or 40 pieces, and larger quantities of a pattern, he can now in no instance get an order for more than five pieces. Has at former periods received orders for 200 pieces of one pattern when it has been a block pattern; and has received orders for 1000 pieces of an engraving; but in that case he confined the patterns to the party who gave the orders. Nobody will engage a pattern now, from the apprehension of its being copied. Cannot at present take an order from any merchant without giving a guarantee that those goods have not been sold before, and further, that no goods shall be delivered to one party sooner than another. Three months does not give adequate protection, arising from a knowledge among his customers that his patterns are copied. He does good work, and produces good patterns which are run at in Manchester as soon as they are out. His goods are all packed at his works, but with every package for exportation, he sends a a pattern-book, containing a pattern of every piece in the package, and a duplicate of that pattern-book to the merchant who buys the goods. He sends pattern-books to the shippers, who, he believes, sometimes sends them to the printers who copy them. Has seen a book that was given for that purpose—given by the merchant. Knows the fact of a printer going to the merchants to apply for the books. Produces about 300 patterns in the course of a year upon an average; cannot say how many of these have been copied, but the copying has been so extensive, that in general terms, should say the best of them have all been copied; the injury done was as great as if the whole had been copied. Will state

to the committee an instance, showing that this copying is carried to a great extent. On the 12th October last he took an order for 700 pieces from a London merchant who trades to the West Indies, and had been a customer for years, and had been doing a large business with him. In the 700 pieces there were eighty-three patterns. These goods were delivered about the middle of December. Delivered the pattern-book himself about the 20th. Was informed by the merchant, that in January, goods were to be had, pattern for pattern, the same as those sold him in December, 20 per cent. under the price charged, but on an inferior cloth. So that the entire 83 patterns were in the course of 1 month copied and offered for sale in competition with the original at a reduction of 20 per cent. Four years ago this merchant was doing a large business with him, which continued up to March 1838; since that it has gradually fallen away, and at length ceased in consequence of the way in which his patterns were copied at Manchester. The orders he used to receive are now given to parties who are copying his patterns in Manchester —knows that. Has had his patterns copied after the end of 3, 6, and even 12 months. A protection of 12 months would not prevent that, but if he had 12 months' protection, fancies he should be paid, and would not care who copied after that, because he would then be producing something new. Another serious instance of copying was as follows: in June last witness sold goods to a house in Jamaica, patterns very suitable to that market. In January, had a letter from his agent in Glasgow, giving an extract of a letter from Jamaica, countermanding their order, because the goods were then coming out from Manchester on lower cloths at lower prices. Knows the printers who copied in these instances, but did not apply for injunctions against them. Was not able to do so till within the last ten months. The law did not extend to Ireland; and to mark the pieces as the Act directs is a very troublesome thing; the three months' protection is not worth it; the first sale is all that three months' protection could ensue, could have no repetition with that protection, and therefore does not mark the pieces. Would mark them for 12 months', but not for three months' protection; the parties copying the goods have only to hold them over a month, or six weeks at most, after taking the time to copy them, to be out of the time of protection, and the buyers being aware that those are coming out, will not give witness a repetition of their orders. Objects to a registration in a great measure; but were he insured 12 months' protection, would take the trouble of making the pieces for it, and registering. If a system of registration were introduced, and he were perfectly secure that no one should see his patterns, if it cost but a very small trifle to register, and the tribunal before which it was to be tried, was one where no copier could have any influence either in presiding or appearing further than to answer witness's affidavit, his objections to a registration would be greatly overcome.

(*To be continued.*)

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM WINSOR, RATHBONE - PLACE, OXFORD-STREET, ARTISTS' COLOURMAN, *for a certain method of preserving and using colours.*—Rolls' Chapel Office, August 22nd, 1840.

This invention applies to colours known among artists as "bladder-colours," and consists in the substitution of glass or metal tubes for the bladders in which they have usually been put up. In order to adapt them to this purpose, cylindrical glass tubes, open at both ends and furnished with projecting lips or rims, are fitted with an elastic piston of cork, or a compound piston of cork, paper, &c. This piston is securely fastened by some cement, not acted upon by the vehicle in which the colour is mixed, upon a central block of hard wood, ivory, metal, &c. tapped with a coarse female screw. A corresponding male screw of metal or other suitable material, rather longer than the tube, and terminating in a milled head, works in that of the piston. A circular plate of metal, rather larger than the tube, is tied upon one end by a piece of membrane placed over it, and secured by the rim before mentioned. This plate and membrane has a hole, through which the male screw slides freely up or down. This screw being put into its place and screwed round, draws the piston up to the top of the tube, which is then filled with the colour previously ground and properly prepared for painting; the open end of the tube is then closed with another metal plate and membrane, having a small hole closed by a temporary stopper of wood, ivory, or metal. In this state the colour is supposed to be *preserved* free from the pernicious effects of atmospheric influence. When required for use, the stopper is to be taken out, and a few backward turns given to the screw, which will cause it to project a short distance from the head of the tube; upon pushing it in, the piston, hitherto quiescent, will be forced down, and the colour squeezed out from the lower aperture on to the palette. Of course, the screwing and pushing must be proportioned to the quantity of colour required for use.

It seems to be taken for granted, that the apparatus will continue air-tight—that the

piston will always remain stationary during the rotation of its screw spindle—that no clogging from the drying and solidification of the colour will ensue—and that no inconvenience will attend the use of this philosophical substitute for the "colour-bladders" of our forefathers.

PETER BANCROFT, LIVERPOOL, MERCHANT, AND JOHN M'INNES, LIVERPOOL, MANUFACTURING CHEMIST, *for an improved method of renovating or restoring animal charcoal after it has been used in certain processes or manufactures to which charcoal is now generally applied, and thereby recovering the properties of such animal charcoal and rendering it again fit for similar uses.* Petty Bag Office, Sept. 22, 1840.

This is proposed to be accomplished by the use of alkali, in the following manner. In order to get rid of the colouring matter, and other impurities remaining in charcoal that has been employed for various discolouring and purifying processes, it is to be well washed and then saturated with a solution of caustic potash or soda (spec. grav. 1.06) and left at rest for several hours. The caustic alkali will abstract and hold in solution the various impurities of the charcoal; this being drawn off, the charcoal is to be washed in a running stream of hot water, till every trace of the alkali is removed, and it is then again fit for use. The claim is for the method of restoring animal charcoal, and rendering it fit for use, by the employment of an alkali.

THOMAS TASSEL GRANT, OF HER MAJESTY'S VICTUALLING OFFICE, GOSPORT, *for Improvements in the manufacture of Fuel.* Petty Bag Office, Sept. 24, 1840.

These improvements consist of a mode of manufacturing artificial fuel from coal dust in combination with coal tar or other bituminous substance. The tar being thoroughly heated, small coal is incorporated therewith, in the proportion of 20 lbs. of the tar to every cwt. of the coal dust. When perfectly combined, this material is moulded into bricks for use.

HENRY SMITH, OF BIRMINGHAM, LAMP MANUFACTURER, *for improvements in gas burners and in lamps.* Enrolment Office, September 25th, 1840.

The improvements consist in the application of a horizontal deflector to the argand burners of gas and oil lamps at a slight elevation above the point of combustion, so that the current of air rising around the outer cylinder of flame, may be deflected and made to impinge upon it in a nearly horizontal direction, thereby increasing the intensity of combustion and the production of light, with the additional advantage of obtaining so much of the light of the flame below the deflector as was formerly hid and lost. The "*additional advantage*," which forms the very soul of this patent (the ordinary mode of using a similar deflector being expressly disclaimed), seems to be of a very doubtful character, inasmuch as little, if any, *light producing combustion* takes place *below the deflector.*

Claim is made to three separate modes of accomplishing this object. 1. By means of a glass cylinder. 2. By a wire support upon an open frame. 3. By means of an expanding rim within a glass chimney. In the first case a short glass cylinder, rather smaller than the glass chimney, supports a horizontal metal deflector at the desired point; brass is preferred. In the second instance it is supported by wires rising from an open frame. In the third mode an open ring is employed, which, having a tendency to expand, presses upon the inside of the glass chimney, and thereby supports the deflector at the required height. If there were any real advantage in this arrangement, it has been most effectually superseded by giving the requisite form to the glass chimney itself, and so realising all the advantages sought for, without any additional appendage.

SIR JOSIAH JOHN GUEST, OF THE DOWLAIS IRON WORKS, GLAMORGAN, BARONET, AND THOMAS EVANS, OF THE SAME PLACE, AGENT, *for certain improvements in the manufacture of iron and other metals.* Rolls' Chapel Office, September 28th, 1840.

The improvements consist principally in the introduction of jets of steam into the puddling furnace while the iron is in the state usually called "fermentation." The success of the operation depends very much on bringing the steam in close contact with the melted iron, to effect which, wrought iron telescope tubes, sliding one on the other, are employed; the jet pipe being ¾ of an inch in diameter, and the steam pressure 15lbs. upon the inch. These tubes are raised or lowered according to the quantity of fluid metal in the furnace, by means of a suitable lever.

In the second place, jets of damp steam are introduced into the refining furnace, after the pig iron is melted, through the same apertures as the blast, the quantity and pressure of the steam being regulated by the quality of the metal acted upon. During this process, in order to keep the sides, bridge, and bottom of the furnace from burning, a quantity of steam is introduced upon the fluid cinders as soon as the heat is drawn, until the cinders become of the consistence of paste; this paste is then raked up against the back, sides, and bridge of the furnace, so as to fill up any cavity that may have been burned during the previous heat of iron. The use of cinders in this state keeps the iron quite clean and free from the dirt which always attend the use of clay and limestone. In this instance four jet pipes are used, ½ an inch in diameter, and steam of 20lbs. on the inch. The steam may be generated in a

tube or cylinder in the furnace chimney, or may be supplied from a regular steam boiler.

The employment of steam in a similar manner in melting the alloys of copper and iron, and iron and tin, is also claimed, but the particular application is stated to be to the manufacture of iron, whereby a better material is obtained with greater economy. The claim set forth is for the use or application of steam forced upon or into, or in contact with the melted iron in the refining or puddling furnaces for the manufacturing of the same; also for the similar use of steam in the process of melting or manufacturing alloys of copper and iron, and of tin and iron, in such furnaces; and lastly the application of steam to fluid cinders as described, to produce the paste aforesaid; and the use and application of the said paste.

John Bethell, of St. John's Hill, Wandsworth, Surrey, Gentleman, *for improvements in heating and preparing certain oils and fatty matters.* Rolls' Chapel Office, September 28th, 1840.

The object of these improvements is to render various animal and vegetable oils useful for lubricating machinery and for illumination, by precipitating a portion of their gelatinous, or albuminous matters, and when such oils are intended for burning, by adding thereto hydrocarbons, or essential oils. In the first process the common oil is thoroughly mixed with a solution of tannin, an infusion of gall-nuts in water being preferred, of which 10 gallons are employed to 100 gallons of oil; after standing three or four days, and all the tannin and precipitate matter has been thrown down, the clear oil is drawn off and mixed with a solution of acetate of lead, acetate of alumine, or sulphate of zinc. If acetate of lead is employed, the solution consists of 1 lb. of that salt to six gallons of water; if acetate of alumine, 1 lb. to four gallons of water; or if sulph. of zinc, 1 lb. to six gallons of water; 10 gallons of one of these solutions is to be used to each hundred gallons of oil; but the patentee does not confine himself to these proportions. This mixture should be kept at a temperature of about 70°. If the water should ultimately appear in excess, the mixture must be agitated with 10 per cent. of fresh calcined sulphate of lime in fine powder, and cleared by precipitation while at rest, or by filtering through oil-bags. In the second process, to the oil purified in the above manner, or to the most fluid parts of palm or cocoa nut oil, the patentee adds from 5 to 10 per cent. of any of the following essential oils, or hydrocarbons, viz.: petroleum, naphtha, fine oil of turpentine, or the best essential oil obtained from the distillation of coal tar, or the oil obtained by the distillation of any of the essential oils before named with palm or cocoa nut oil. The quantity added to be regulated by the kind of oil operated upon, and the inflammability required, varying from 5 to 10 per cent. The essential oil, or hydrocarbon is to be intimately combined with the bulk of oil, by agitation, or by passing the vapour of the essential oil into it by a Wolfe's apparatus, but the agitation is preferred. If from the original purity of the oil, or from so fine an oil not being wanted, it should not be necessary to employ both processes, one will be sufficient, the latter being preferred. For a superior burning oil both processes are preferred, but for a lubricating oil the first only is to be used.

The process for heating and preparing fatty matters, is as follows:—to any given quantity of "butter of palm," or rough palm oil, or other concrete vegetable oil, add about 20 per cent of essential oil; put the mixture into a common still, on the application of heat, the essential oil and the volatile portion of the palm or other oil will come over and may be used as before directed. Preference, however, is given to distillation by steam, in the following manner:—put the mixture into a close wooden vat furnished with a steam pipe from a boiler branching out into a series of perforated pipes at the bottom of the vat; the charging hole of the vat being closed, turn on the steam, when all the volatile products will be driven off and may be collected by a refrigerated worm in the usual manner, for use. The concrete fatty matter remaining in the vat is said to be left in a more useful state for many purposes to which it is applicable.

Henry Martin, of Morton-terrace, Camden Town, *for improvements in preparing surfaces of paper.*—Enrolment Office, September 30, 1840.

The processes constituting these improvements, as claimed, are fourfold, viz.: 1. The mode of preparing surfaces of paper by combining thereon a coating of oil paint, with subsequent embossing, as afterwards described. 2. The mode of preparing surfaces of paper in the manufacture of paper-hangings, by combining thereon a coating of oil paint, and afterwards printing or producing thereon the required pattern. 3. The mode of preparing surfaces of paper by combining thereon a coating of oil paint, and subsequently glazing or planishing the same. 4. The mode of producing a coating of oil paint on paper. by means of rollers. The paint used for this purpose is the same as ordinarily employed in house painting; a piece of paper of 12 yards, or other required length, is to be laid upon a table of similar dimensions, sized with one or two coats of common or superior size, and then painted with an ordinary brush; while yet wet, the surface is to be smoothed over with a dry brush, to take out the marks left by the first, and subsequently finished with a badger softener, which pro-

duces a smooth and level surface, so essential to the success of this process. In the other process, oil colour is laid on the surface of paper by passing it between two rollers, together with an endless felt; this felt in its revolution is supplied with oil colour by passing into a trough, and under a roller partly immersed in the colour; a scraper removes the superfluous colour as it rises, and levels and equalises the colour; the paper is passed through the rollers two or three times, according to the thickness of colour required. Paper thus prepared on the surface, may be embossed with engraved dies or rollers in the usual manner, or printed with blocks, &c., for paper hangings, which may be washed with soap and water when soiled. If marbled paper is to be produced, the colours are thrown upon water in the usual manner, the effect being increased by softening off before they are dry. If the surface is to be glazed or enamelled, the oil colour is thinned wholly with turpentine, as a flatting colour; when set, it is to be mounted on a woollen cloth, cotton velvet, or other firm soft bed, and smoothed over with a pallette knife, or trowel having a very smooth surface; when dry and hard, the polish may be heightened by any of the usual methods, which will produce a beautiful surface for copper-plate printing, paper hangings, and various other purposes.

STEAM-BOAT CHALLENGE FOR ONE THOUSAND GUINEAS.

Sir,—Seeing in your last Magazine the challenge of Mr. Smith to sail any common paddle-wheel steamer, &c., I enclose my answer to that challenge, as it appeared in the *Sun* paper of the 22nd ultimo, and shall thank you to insert it in this week's publication, knowing that it will be appreciated by many of your readers. Active measures are taking by my friends to prove the merits of the two plans. Your compliance will much oblige,

Your obedient servant,
JAMES LOWE, Patentee.

Wellington-street, Blackfriars-road,
October 1, 1840.

Steam Boat Challenge for One Thousand Guineas.

To the Editor of the Sun.

Sir,—My attention having been directed to the above challenge, which appeared in your paper of the 17th instant, I take the earliest opportunity of noticing it, and shall feel obliged by your inserting my reply, and *anxiety* to test the boasted merits of the *Entire Screw* of Mr. Smith, with *my patented improvements in propelling* by means of *curved blades*, or *segments of a screw*, upon which plan I have been experimenting during the last two years.

Mr. Smith knows perfectly well that there is no *paddle-wheel steamer in the kingdom* of the *exact power*, tonnage, and draught of water of the *Archimedes*, and consequently he *runs no risk of losing his money*; but, to give him a *chance of winning mine*, I agree that a trial shall take place in the *open sea*, over a distance of 100 or 500 miles, for the sum named by him, but *upon this plan*, viz.:—That the *Archimedes* shall be fitted with the *entire screw or worm, patented by Mr. Smith*, and the distance and time of performance noted by qualified persons, and appointed by each party, the *Archimedes* doing the distance *first*. That the screw shall then be removed, and the vessel fitted with my curved blades or segments of a screw; the expense of such alteration, together with all the incidental charges consequent on the trial, such as coals, wages of engineers, &c., to be defrayed by me. The alteration to my method may be effected in a few hours, by merely taking the screw from the shaft, and fitting *the segments*, which are so contrived as to be easily adjusted to any position or angle required.

By this plan the merits of the two inventions would be fairly tested, and the world would know whether Mr. Smith had overcome *at last* all the drawbacks and disadvantages which *all Patentees* of the Archimedian screw had been obliged to yield to, or for ever have to contend with.

If Mr. Smith thinks my proposal *one-sided*, or likely to throw a preponderating degree of risk and trouble on his part, in proportion to mine, I will (provided he complies with my proposition of the *Archimedes* making the trials) sail him *either* of the before-named distances, *Five* Hundred Guineas to *Four*, and thank him too.

N.B.—The trial to take place before the 15th October next.

I am, Sir, your obedient servant,
JAMES LOWE, Patentee.

No. 38, late 27, Wellington-street, Blackfriars-road,
September 21, 1840.

THE "FATHER THAMES" STEAMER.

Sir,—Hearing a great many reports of the high speed attained by the *Father Thames*, I took a trip to Gravesend, in order to satisfy myself as to their truth, and I found them to be perfectly correct. When we reached Blackwall the *Eclipse* was just starting, and by the time we were a quarter of a mile ahead she was at full speed. On nearing Gravesend it was very evident that the *Father Thames* had increased the distance between her and the *Eclipse* considerably. On asking permission to visit the engine-room, I was *not* refused, as your correspondent, "A Subscriber," says he was. I there found no attempt at concealment of any part of the machinery, but all "fair and above

board." Her engines are 35 horse-power each, and she has only one boiler, and not boilers, as stated by "A Subscriber." I certainly expected, from "A Subscriber's" account, to find much greater *vibration*. The rattling of the funnel proceeded from the arms used for lowering it striking the sides, and was easily prevented (while I was on board) by placing two pieces of wood between them and the funnel. This would have been occasioned by very slight *vibration*.

I am, Sir, your obedient servant,

T. D. S.

September 30, 1840.

THE "ECLIPSE" AND "FATHER THAMES" STEAMERS.

Sir,—The second letter of "A Subscriber" on the *Eclipse* steam-boat, at page 331, is upon the whole strikingly confirmatory of the account I transmitted you. His mode of guessing at the *pressure* by the *colour* of the steam, is vague and unsatisfactory, and I fear very wide of the truth; his *impression* gives it at 8 or 9 lbs. on the inch, but from the length of the steel-yard lever, I should put it down at considerably above 10 lbs. If it is not more than this, Mr. Napier can soon remove any injurious impression likely to arise from this supposition.

I beg to state, that I clearly understand the nature of *vibration*, and also the *shooting motion*—both of which are to be found abundantly in the *Eclipse*. As to which of the two is *most unpleasant* may be a matter of taste, and therefore "A Subscriber" is entitled to his own opinion. For my own part, I found the shooting motion exceedingly disagreeable; sitting abaft the cabin table, sipping Bohea, I kept making a series of "booings" to some ladies on either hand, who could not understand the involuntary noddings continually perpetrated by "the rude stranger," until an apology and explanation converted the annoyance into a ludicrous occasion of merriment. The motion is, as represented by "A Subscriber," that of a boat impelled by a pair of sculls; it is not, however, to anything like this extent, "common to all boats with *one* engine"; nor does it arise merely from the quicker motion of the engine after passing the centres. It arises from the great difference in velocity between the up and down strokes of the piston. The great weight of the *steeple*, and its various appurtenances, acts against the piston in its up stroke, and with it in the descent, giving so great an impetus and inequality to the motion of the paddles, as to produce the evil complained of.

With respect to the opinion I ventured as to the relative speed of the *Eclipse* and the *Father Thames*, my *supposition* has been fully realised, the latter vessel having beaten the *Eclipse* in a fair run to Gravesend, by four minutes.

"A Subscriber's" description of the *Father Thames* exhibits a sad specimen of *guess work*; he says, the "boilers" are "Spiller's" patent. There is *one boiler*, and that is *not* "Spiller's patent." The steam pressure is said to be about 8 lbs. on the inch, *it is under* 5 lbs.! Perhaps "the colour" has misled again! With respect to the rattle of the *funnel*, "A Subscriber" has also shown that he is either a very partial or a very careless observer; and as to the shaking of the cabin tables, ditto.

The *Father Thames* was, I believe, hurried on to the station to relieve its *Sons*, without receiving that attention to minor points which a little practical experience soon sets right. But I fancy "A Subscriber" may now take another trip, if his humour wills, in "the fastest packet in the world," and escape those several disagreeables which he oddly enough stumbled upon in his last excursion.

I am, Sir, your very obliged servant,

CANDIDUS.

Margate, Sept. 29, 1840.

NOTES AND NOTICES.

Cornish Engines.—A deputation from the Dutch government having visited Cornwall in order to ascertain by actual inspection whether the duty performed by the steam-engines employed in the mines is equal to what is stated in the monthly reports, the adventurers and agents of the undermentioned mines kindly permitted an experiment of six hours to be made on their several machines, and the duty as stated below was the result:—Wheal Vor, Borlase's engine, 80 inches single, 8 feet stroke, 123,300,593 lb. lifted one foot; Fowey Consols, Austen's engine, 80 inches single, 9 feet stroke, 122,731,706 lb. lifted one foot; Wheal Darlington engine, 80 inches single, 8 feet stroke, 78,257,765 lb. lifted one foot; Charlestown United Mines, 50 inches single, 7 feet 5 inches stroke, 55,912,392 lb. lifted one foot; Charlestown United Mines, stamping engine, 32 inches single, lifting 66 stamps, 60,525,000 lb. lifted one foot; Wheal Vor stamping engine, 36 in. double, lifting 72 stamps, 50,085,000 lb. The number of pumping engines reported this month is 55. They have consumed 3,730 tons of coal, and lifted 36,000,000 tuns of water 10 fathoms high. The average duty of the whole is, therefore, 54,500,000 lb. lifted one foot high by the consumption of a bushel of coal.—*Lean's Reporter.*

Ascent of the Nassau Balloon.—On Tuesday afternoon, at three o'clock, Mr. Charles Green, made his 278th ascent, in the Nassau Balloon, from the spacious grounds of the Commercial Gas Company, at Stepney; accompanied by Mr. Isaac Mercer the engineer to the company, and three other gentlemen. Free access to the grounds, was most liberally given to the respectable inhabitants of the vicinity, of which a large assemblage availed themselves, while the locality around afforded an uninterrupted view to a still larger multitude. Nothing could exceed the propitious state of the weather, the sun was shining brightly, amid an almost perfect calm. When loosed from the ties which held it to the earth, the ponderous machine with its intrepid voyagers, rose majestically in an almost vertical direction; on attaining a considerable elevation it took a southerly direction, but soon entered an opposite current, which caused it to retrace its steps and again hover over the spot which it had just quitted. After thus remaining in sight for about half an hour, the balloon veered to the south east, and it is presumed fell somewhere in the county of Kent.

W. B.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office.

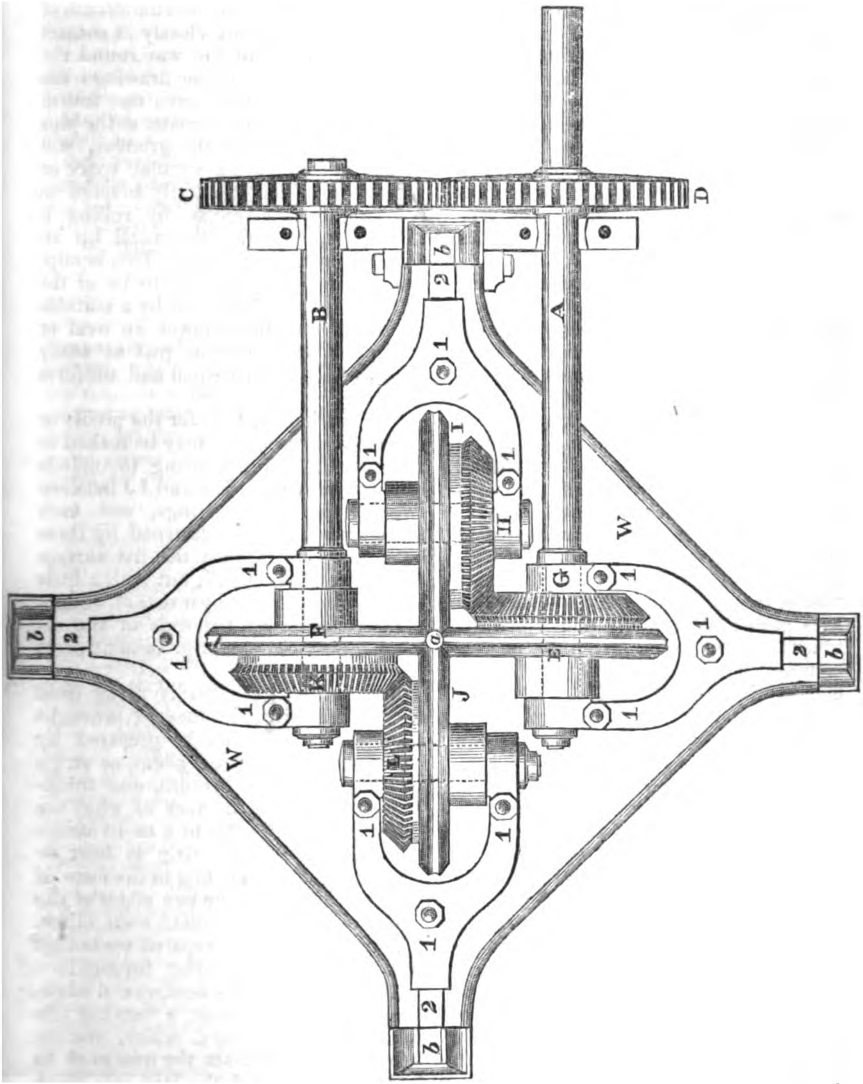
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 897.] SATURDAY, OCTOBER 17, 1840. [Price 3*d.*

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

PROSSER'S IMPROVED MACHINERY FOR MANUFACTURING PIPES.



PROSSER'S IMPROVED MACHINERY FOR MANUFACTURING PIPES.

The process of manufacturing metal pipes by passing them between a pair of grooved rollers is of some standing; the use of such rollers for this purpose, was the subject of a patent granted to Mr. Wilkinson in, or about the year 1790, for making lead pipes; the subsequent application of this principle to the bending up and welding of iron pipes, was patented by Mr. Osborn in 1817.

It has been observed, however, in working, that the pressure is not in this case applied uniformly to the whole circumference of the pipe: the compression, when the rollers are placed one above the other being very great upon the upper and under surfaces—and very slight laterally, *i. e.* upon the two sides of the pipe.

In order to obviate this practical difficulty, Mr. Richard Prosser, civil engineer, Birmingham, has recently patented "certain improvements in machinery or apparatus for manufacturing pipes," in which he ingeniously employs two pairs of grooved rollers, working in combination, so as to cause an equal and uniform pressure to be given around the whole circumference of the pipe. The manner in which this is accomplished will be understood on reference to the engraving on our front page, which is a vertical front elevation of this portion of the apparatus. A and B are two axes placed horizontally one above the other; motion being given to one, is communicated to the other by the two equal spur wheels C and D. E and F are two circular wheels upon the axes A B respectively, having a concave groove around the circumference of each. I J are two similar wheels, also furnished with concave grooves on their circumferences, like the former. The wheels I J are both placed in the same horizontal plane with their concave grooves corresponding, so as to form a second or additional pair of revolving grooved rollers, and with the former completing the circumference of the circle *a*, corresponding in size to the pipe required to be made. The requisite motion is communicated to the two wheels I J, by means of the bevil wheels K L, the teeth of which gear into similar bevil wheels G H. All the wheels being of equal size, the motion of the grooved circumferences of the four rollers which receive the pipe between them will be exactly alike, and their uniform motion and pressure will have the effect of compressing the metal pipe above, below, and on each side, at the same time.

The edges of the rollers I, J, E and F, are bevilled, so that the circumference of all the four wheels are closely in contact with each other all the way round the pipe *a*, as shown in the drawing; the concave grooves being each one fourth of a circle of the same diameter as the pipe required, all four of the grooves, will between them, leave a circular space or passage *a*, which is exactly adapted to receive the pipe, so as by rolling it through to compress the metal on all sides as before explained. This is supposing the pipe is required to be of the usual cylindrical form, but by a suitable modification of the grooves, an oval or any other figure may be just as easily produced, by similar equal and uniform pressure.

The bearings 1, 1, 1, for the pivots or gudgeons of each axis may be forked as represented in the drawing, to include each wheel or roller E F and I J between two of the said bearings, and each forked piece may be fastened by three or more screws against the flat surface of the fixed framing W, but with a little liberty of adjustment by means of wedges 2, inserted between the ends of the several forked pieces and prominent parts (*b b*) of the frame.

When this apparatus is to be used for making welded pipes of wrought iron, the iron should be prepared by rolling into thin narrow plates or strips of suitable length, breadth, and thickness, in the usual manner of what are called "skelps." About 8 or 10 inches at one end of such strip is bent or turned up, approximating to the form of the intended pipe—the two edges of the iron being made to meet each other. The strips of iron so prepared are heated in a reverberatory or other furnace to a welding heat, and the bent up end introduced into the passage *a* between the four revolving rollers, which, seizing hold of it, compresses the iron so as to bring the edges of the iron into close contact, whereby the welding is effected. As the iron moves forward through the

rollers, that portion of the strip that was left flat becomes, as it approaches the rollers, bent up, rounded, and welded. Or, if preferred, the whole length of the skelp may be bent up into a gutter or groove by means of a tool known in the trade as "the crocodile," previous to inserting it between the rollers. In connection with the grooved rollers, a fixed mandril is employed, of the size which is to be given to the pipe internally, the effect of which is to support the pipe under compression, to render it smooth on the inside as well as outside, and to ensure uniformity of bore throughout.

Mr. Prosser proposes to use two or three of these machines, in combination, one before the other: the circle formed by the grooves in the second set being smaller than that of the first, and the third smaller than the second; the pipe passing through these diminishing apertures is gradually compressed, by which means the edges are more effectually welded, and the pipe rendered more perfect. If a curved pipe is required, curves of any convexity may be produced by placing the machines in a circular position, and passing the skelp through in the usual manner.

THE "ARCHIMEDES" *v.* THE "WILLIAM GUNSTON."

Sir,—I observed in No. 895 of the *Mechanics' Magazine*, some remarks by Mr. Christopher Claxton, relative to the trial of strength between the *William Gunston* and the *Archimedes* steamers, and I was surprised that Mr. Claxton should deny the fact of the *Archimedes* towing the *William Gunston*: as the former towed the latter three times across the river. During this towing, the engines of the *William Gunston* were at rest, but when in motion, although she had to tow against the stern way given to her by the *Archimedes*, she very soon stopped the way of that vessel, and then dragged her astern. Mr. Claxton observes, that the trial only lasted "ten minutes;" if so, as the *Archimedes* towed the *William Gunston* three times across the river, the latter must have towed back the former at a very quick rate indeed, the distance being about three or four hundred yards. The same gentleman observes, that it was a matter of doubt for some time, whether the *William Gunston* would tow her or not. I deny this, unless he means before the engines of the *Gunston* were set in motion; for, as I have before observed, she very soon brought the *Archimedes* up.

With respect to the pressure of the steam on the *William Gunston*, it is the same now as when she left the manufactory; the safety valve being so constructed, that the engineer has no power to add to the pressure. If the diameter of the cylinders of the *Archimedes* is, as stated in the Magazine, 36 inches in diameter, those of the *William Gunston* being only 27 inches each, there will, I am afraid, be some trouble in making out that "the *Gunston's* power proved considerably superior to that of the *Archimedes*." I had no concern whatever in the article complained of by Mr. Claxton, but if "the whole truth and nothing but the truth," is to be told, I flatly deny Mr. Claxton's assertion, namely—that "*the Archimedes never towed the William Gunston*;" for I distinctly state *that she towed her three times across the river.*

I am, Sir, your obedient servant,

JOSEPH BLACKBURN,
Engineer of the *William Gunston*.

October 15, 1840.

RAILROAD ACCIDENTS.

Sir,—Although I am not a thick and thin advocate for railroads as now applied and conducted, still I cannot help feeling great pain at the recitals of the numerous fatal and injurious accidents which continually occur on the lines. Many suggestions are given by the public papers to give security, none of them of a mechanical and positive nature, but all only depending upon a greater degree of attention, or, as the French call it, *surveillance* of the people employed upon the lines. This is but a flimsy protection to the travellers, maugre all good intentions and intended diligence on the part of the railroad directors, engineers, and their servants. I have watched their conduct very closely on several lines, and I must say that zeal and caution predominate in all they do, as far as *I* have seen. One case I must allude to, and that was of a young man cut in

twain on the Croydon line, by reason of an error of management, on which I had twice written in the public papers, but unheeded.

A train of "*ballast*" waggons, full of earth, is drawn to a certain point, then emptied. Well and good; but when they are taken back again *empty*, the engine's action is reversed, and the *empty* train is *pushed* before it at an enormous speed. On coming to a curve it is quite evident that the train, attached together in loose connections for *tractile* action, is liable to be pushed off the rails. This I saw happen on the Croydon line, with loss of life. I know of other cases in the north, but which it might be thought invidious for me to publish. The theory of this error is just like unto a man *pulling* a rope behind him; if he were to attempt to *push* it before him, it surely would not follow, or rather take, a straight line. Such is the case with an engine *pushing* a train, and especially an *empty* one, *before* it. Several fatal accidents have occurred from this practice. But the main object of this note is to draw your attention to the communication of one of your numerous correspondents, I think about two years ago, which your index will point out, of a frame for steam railroad engines and carriages, which, at the time, struck me as being so constructed as to render their going off the rails impossible.*

I have the honour to be, with high esteem,

Sir, your obedient, sincere, &c.

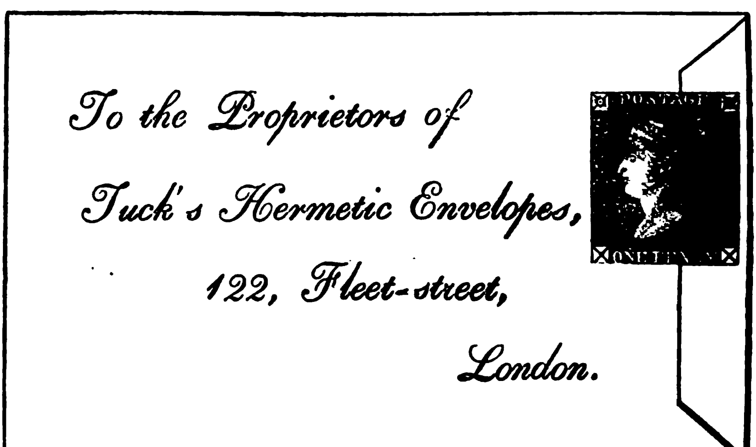
MACERONI.

P.S.—I have not treated on the propriety of increasing the flanges of the rails and wheels.

1, St. Martin's-place, Trafalgar-square,
30th Sept. 1840.

TUCK'S HERMETIC ENVELOPES.

(Registered pursuant to Act of Parliament.)



Among other consequences that have grown out of the new postage system, is the universal employment of envelopes, which have now become almost essential to all polite or official correspondence. A writer in a late number of the *Quarterly Review*, alluding to the employment of envelopes, observes they "are very popular, particularly with the higher and middle classes, because it is the fashion, and a mark of *bon ton* to enclose one's letter in an envelope. A scheme, there-

* We have not been able to identify the communication alluded to.

fore, that enables all to indulge in this little aristocratic convenience, is pretty generally acceptable: an envelope is, besides, more easily sealed and more secure when properly sealed." One evil attending their employment, however, has been the great facility with which access may be obtained to the interior without detection, thus permitting the over-curious or the dishonest to rifle the enclosure of its secret, or its pelf. The writer already quoted, observes that "the corners now in use are generally *very unsafe*—nothing can be so easy as to detach one of the folds, extract the letter, read and replace it, without any possibility of detection." The injury which has been occasioned by family secrets transpiring in this manner, is of the most distressing kind; much worse, in fact, than the consequences of fraud and dishonesty in abstracting matters of more intrinsic value.

These evils were no sooner made apparent, however, than ingenuity was excited to produce an antidote, and an effectual one was the result. We have much pleasure in giving the testimony of our experience (some months') to the convenience and security afforded by the Hermetic Envelope, of which the prefixed is a representation, and which our readers will perceive is on an entirely novel and original plan. The title "Hermetic," though not strictly correct, is nevertheless an appropriate one, pointing out as it does the peculiar and meritorious character of the invention. When once sealed, this envelope forms an impenetrable depository for all kinds of correspondence (actual force always excepted, from which no letter of any sort can be exempt). There is but one flap, and that is only to be slipped aside by breaking the seal. For the enclosure of bills of exchange, confidential communications, legal and official documents, &c., this envelope must, we think, be invaluable.

A. M. Skene, Esq., of Durham, lately wrote to Colonel Maberly, suggesting that the postage stamps should be used as seals, to which he received the following reply:—

"General Post Office, Sept. 20th, 1840.

"Sir,—In answer to your letter of the 20th inst., I beg to inform you, that if the postage stamps are placed on the backs of the letters, as you propose, it is impossible to prevent their being charged with postage, in the haste and pressure under which all the business of the Post-office must be discharged.

"James Campbell,
"For the Secretary.

"To A. M. Skene, Esq."

Now, "Tuck's Hermetic Envelopes" completely meet the views of this gentleman, as in them the postage label is made to serve the double purpose of *sealing* and *franking* the letter; thereby superseding the use of wax or wafer for all ordinary purposes. The way in which this is accomplished will be at once apparent from the accompanying sketch. The postage label being previously attached to the flap of the envelope, when the letter is inserted, it is only to moisten the paper, press down the label, supply the direction, and it is ready for posting. When further security is required, a wafer or wax may be added. The form of this envelope affords a degree of security as well as convenience and facility in despatching, possessed by no other, and which strongly commends it to public favour and patronage.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Continued from page 380.)

Mr. James Kershaw, is a calico printer at Manchester, a partner in the firm of Leese, Kershaw and Co. Has been in that business from 18 to 20 years; is an Alderman of the town of Manchester, and a magistrate of Lancashire. They have print works at Ardwick, near Manchester. Employ their own designers; at present they have five, but sometimes have six. They purchase patterns besides those obtained from their own designers. As near as he can calculate, should say, that 500*l.* a year is the expense of production of designs by their own designers, and about 100*l.* a year for those they purchase from persons who offer them in the trade. They produce about 1,200 patterns in the year from their own designers, and may purchase about 300, Of these they actually engrave but about 400. Cannot say exactly how many of each, because they do not print so many in proportion of those they purchase, as they do of their own production, because they have not the same confidence in their being original, or comparatively original, or original in the common acceptation of the term among calico printers. Has made a particular calculation, and included in it some trifling expenses which are incurred for the

purchase of French and cloth patterns, and other expenses in what is called putting on, or preparing for engraving; including all those expenses, he makes the patterns produced by their own designers, and those purchased from others, to cost as near as possible 8*s*. a pattern. This does not include the expense of engraving. After a nice calculation, they find the engraving of their designs cost upon an average 6*l*. per pattern; taking the average of colours, whether they be single colours, two, three, or four colours, 6*l*. per pattern will cover the expense of engraving. Thinks it is exceedingly difficult to decide what are new and original patterns; thinks it almost impossible. When we consider the millions of patterns that have been produced during the existence of the copyright, that their approximation to each other is so exceedingly near, and that they have run through a period of nearly half a century, and that no registration has existed to enable us to know what has gone before, all these circumstances render it, as it appears to him, a matter of impossibility to ascertain whether a pattern is new and original. Believes the judges of patterns in general might be mistaken in point of originality. Receives French patterns regularly; the higher class printers, he thinks receive them universally. One of the most successful, one of the most extensive calico printers told him at a dinner table, at which there were other parties present, that he very seldom did anything at his works but French patterns, and he believes they form the staple of the trade with regard to first-class houses; and he infers, therefore, that they are greater copyists, not of unprotected patterns, but greater copyists in another sense than any other portion of the trade. And it is that best class of printers that are now seeking extended protection, generally; they have a few others with them, but decidedly the first-class printers are those who are seeking the protection, whilst the medium, and lowest class of printers are almost universally against it. The majority in number of the whole trade are decidedly against it, as proved by the petition, but generally speaking, that class of manufacturers, who produce some of the finest textures are in favour of the extension of the copyright. In regard to the number of printers, the majority is against it; and with regard to the production, decidedly against it, both in value and amount. Witness is not of opinion that the character of the art of designing in this country will be promoted by the extension of the copyright. Thinks it will be best promoted by competition, and thinks the designers will get a better reward for their labour by open competition than by a further protection of the copyright. The public undoubtedly will be best served by competition; monopoly, to his mind, means high prices, and he thinks the obvious tendency of giving protection for twelve months to patterns of so slight a value on the one hand, and of so ephemeral a character on the other, will tend to create high prices, consequently injure the public, lessen the competition for designs, and therefore lessen the quantity required, and will also tend to diminish the quantity of engraving, and will, in fact, injure the trade very seriously. He considers that competition produces abundant supply at the lowest remunerating price. His patterns have frequently been copied, they have been copied during the present spring; did not complain of his print being copied; wishes they would copy him more frequently, should then fancy he was bringing out something worth copying. Has never spent a farthing in the protection of his patterns, and hopes he shall never do so. A large class of persons obtain their living by the production and sale of designs, and thinks an extended copyright would injure them. Upon the whole, is of opinion that the extension of the term of copyright would operate most injuriously to the interests of both the trade and the public. Believes that competition and free trade will best serve all parties connected with it, as well as the public. Thinks decidedly, that if parliament should decide upon granting an extension of copyright, it should be accompanied by a registry; indeed he thinks it would be an improvement, if there was no extension, if a registry was instituted, it it could be worked satisfactorily. The registry should be open unquestionably, that parties may be warned against the commission of the offence. At present they may offend against the law without knowing it, or without intending it; and thinks there ought to be an open registry, with a deposit of a pattern, and that that deposit of a pattern being in the nature of an injunction to the public not to vend it, should be accompanied with an affidavit or declaration that such pattern is original, otherwise patterns might be entered which are not original, and the public by that means led astray in the matter. Should not be induced, if the copyright protection was extended to 12 months, to employ more designers than at present; does not see that he should have any occasion for more; is of opinion that he should rather have occasion for less; believes his trade would be lessened, especially during the operation of the first few years, and that he should employ less designers consequently. Should not be induced, if the protection were extended, to give any more attention to the quality of the design. Does not see how he could; endeavours to excel at present; has

every inducement at present, because the success of his trade depends upon it. Though his designs are not of the most superior class, he thinks them the most suited, so far as his markets are concerned, he deals extensively with London and Dublin and Glasgow, as well as with all the foreigners; therefore, although he does not produce the very high-priced prints, yet the great quantity of sales shows that his designs are adapted to those markets, at all events.

Mr. Daniel Lee, of the firm of Wright and Lee, is engaged in the calico printing trade, as a seller; has no works. Resides in the neighbourhood of Manchester, and is a magistrate in that borough. Has the print department under his own immediate superintendance. Has no works of his own, but employs some works exclusively, and others in part; by employing some in part means that those works produce prints for other parties besides. Such houses do not produce similar styles and patterns for other parties; he limits them to his own patterns for himself only. The great majority of his patterns are supplied by himself, and others are patterns which the printers supply and he adopts and makes them his own, thereby obtaining the exclusive use of them. Comparatively, those patterns form a very small portion of his trade. He employs six designers constantly, and frequently eight, who are paid so much per pattern for all the patterns they produce, whether adopted or not. Occasionally he purchases patterns from designers who work for the trade generally. The total number of designs produced for him, and purchased in the course of a year, is about 3,000. Those produced for him being about 2,500, and those purchased about 750, speaking in round numbers. Considers the pattern designing to cost his firm about 1000*l.* a year. He never copies the patterns of other houses; during the thirty-five years his house has existed in Manchester, that has been its character, that it has never copied patterns produced by others. All the patterns so produced are properly termed by the trade original designs, and such as the Court of Chancery would confirm his exclusive right to. Never copies the patterns of others, when the copyright has expired; has a great objection to copying—does not copy French patterns. Of the 2,500 patterns produced, supposes he actually engraves rather above 600 a year. Cuts very few of the purchased patterns; buys them merely for ideas, does not feel safe in cutting them. The total production of his concern per annum in prints is about 700,000 pieces; thinks that is about the average for the last five or six years. Considers that the sale of 500 pieces of each pattern is amply sufficient to remunerate him, and also the printer, for the cost and labour and risk of production; if he could always ensure the sale of 500 pieces he should be quite satisfied. Does not sell anything like 500 of every pattern he produces. Those which do not run so far he considers less successful, and such as go beyond that are unusually successful. When producing a pattern he feels a considerable degree of confidence; he generally has an impression that it will be successful. Does not act to any great extent upon his own favourable opinion; in the first instance he gets up about 50 pieces as a sample and then waits for further orders. Never, from relying on the success of the pattern, ventures in the first instance to print 500 pieces, unless there is a positive order. Is not in the habit of exporting goods, but deals largely with those who do. Deals with parties who are connected with almost every market with which England deals in the four quarters of the globe. Should say so, but it is generally through agents, and he does not know where they send their goods; he does not want to know, and probably if he did, they would not tell him. Has never protected any of his prints under the existing copyright act. A large proportion of his goods are what are called "Navy Blues." Never knew any printer to protect a navy blue. The cloth and colour are not all that is valuable in them; the design is a very great consideration. The navy blues are not the lowest class of productions; there are much lower goods than blues; low spirit plates are of a more common quality. There are even in the production of navy blues a great variety of patterns, notwithstanding the ground may be all of one colour; it is of considerable importance. Of so much importance, that had he considered it worth while to protect his patterns generally, he would have protected these. If he attached any importance to the protection, it would have been very important to protect his blue patterns. It has never formed any objection with his buyers, that his prints were not published, and therefore not protected: never heard it named or alluded to. Has never been asked the question as to whether his patterns were or were not protected. He does not publish according to the Act, so that every one can know that he does not protect them. He puts the name upon every piece. Does not think the amount of his sales any less than it would have been had his goods been protected. Does not think it desirable or necessary to protect his prints, because he does not mind being copied. Has been copied, and he does away with the supposed injury by keeping a constant succession of new prints coming round; and by that means does away the damage, if there is any, but cannot conceive there is any. Does not wait till he has sold 400 or 500

pieces of a pattern before bringing out a new pattern of a similar class, but brings out new patterns every week; and sometimes frequently in the week has had his patterns copied. Some branches of his trade are entirely foreign, and he frequently produces patterns expressly for that; but it also happens that a great number of his home trade patterns suit the foreign markets; should say that he does not produce quite so many, generally speaking, for the foreign as for the home; but contrives them to suit as many markets as possible. Has been copied in the prints prepared for the shipping trade. Has been copied within the term of protection given by law if he had chosen to avail himself of it, and in some of his most expensive patterns. He never complained to the parties; never took any notice of it at all; did not mind it, because his profits were moderate, and he did not fear, knowing that his means of production were fully equal to theirs, therefore he did not mind them, and never made a complaint. Is not always aware of being copied, and does not take any trouble to ascertain the fact. He had three or four patterns of furniture a little while ago, which were copied, and his customers told him of them; he should never have heard of it perhaps had it not been for them; but does not think it interfered with him; he took no notice of them, because he keeps such a succession of patterns coming round that he does not mind it in fact. From the indifference he has manifested on the subject of being copied, it is a fair inference that the copiers have not been able to compete successfully with him. Has never been able to perceive that his sales were affected by the copying. Is of opinion, that because he sells his goods at a moderate profit, the copiers have not been able to compete with him successfully; and they might also find a fresh connexion without interfering with him, and which might have been lost to the trade generally had they not done as they did in copying. Thinks decidedly that to produce and to sell at a moderate profit, is a better protection to the individual than a parliamentary guarantee or a pattern copyright. Has heard very little of copying, never so much as since he came to London on this business. There is not a great deal of copying in the trade. Is sure that his position in the trade is such that copying could not take place to any extent, without his being aware of it; because he sees so many customers that he should be sure to hear of it. Thinks one of their greatest difficulties is to determine whether the pattern is original or not; the patterns which are now produced, are for the most part, merely a combination of ideas derived from early patterns; patterns which have existed before; old objects re-arranged in which there cannot be any originality; there may be a little novelty of arrangement, that is all. There is a great practical difficulty even to a person well acquainted with the trade, in distinguishing a new pattern from an old one. Thinks there would be difficulty to find two persons to agree upon the subject. Should have immense difficulty in deciding himself, and fancies that his experience in these matters is pretty nearly equal to that of most. Has not had a great many patterns copied; does not think he ever saw any of his patterns copied. Thinks there is a difference between original designs and copies, but that old objects arranged in a different form, decidedly does not constitute new and original patterns; they cannot be new and original unless the objects be original. Imagines that if the term of copyright was extended to 12 months, the proprietors of such patterns could not avail themselves of the protection, inasmuch as they could not make the necessary affidavit that they were new and original designs; does not know what they might do—he could not. Does not know whether the opinion he entertains regarding what are originals and what are copies, is the opinion of the rest of the trade; he only gives his own ideas upon the subject. Cannot tell what is meant by "copy;" that is one great difficulty; does not know what "copy" means exactly, a *fac simile* is a copy, and an imitation is a copy; has the authority of Johnson for that, who is a very good authority as to the meaning of the word "copy." On Friday last he called upon one of the most extensive merchants in Manchester, and had a very long discussion on this subject, and he thought that those who advocated the extended protection, were merely going for *fac similes* being copies. He said "if any thing beyond a *fac simile* be called a copy I will go with you at once." This merchant belonged to one of the largest shipping houses in Manchester. An "imitation," as distinguished from "copy," must be something coming very near the original, but how near, he does not know how to define. Has never known any practical inconvenience to arise from any difficulty before a legal tribunal, or any other, in deciding between a copy and an original. Is of opinion, that were the term of copyright extended, there might then arise difficulties in the maintenance of copyright which have not heretofore existed, or which, if they have existed, have not induced the parties to come into court to seek legal redress. Thinks decidedly that the extension of copyright would bring many cases before the public that now do not appear. Considers that extra protection means extra profit, and he considers that it would

be better worth the while of any house to commence proceedings for a twelve months' copyright than it would be for a three months' protection. If the extension of copyright to 12 months took place, he should perhaps, avail himself of it like his neighbours, but is of opinion it would be a most injurious law to the trade generally. That has always been his opinion. Believes he has stated to parties in Manchester that it would be an advantage of 3,000*l.* or 5,000*l.* a year to him if it did pass. But thinks we should experience a corresponding injury in England by not being permitted to copy, while foreigners would be at liberty to do so; and though they do not copy as much now, still he thinks the advantage they would then derive from it would be so great an inducement, that if the proposed alteration of the law was made, it would become a decided trade with them to copy all our best prints, and pour them into the markets which we at present supply. Thinks that in the course of time, this copying by foreigners would take his trade entirely away, and therefore would rather sacrifice the supposed present advantage of 3,000*l.* or 5,000*l.* a year, than lose the whole trade hereafter. His apprehension applies decidedly not to the home, but to the foreign trade. Has stated that if the copyright were extended to 12 months, it would be a probable gain to his house; by taking advantage of that law he should expect to get as good a profit as his neighbours, on his styles (patterns); but the trade in his opinion would gradually fall off, so that the 3,000*l.* or 5,000*l.* would very soon be eaten up by the loss arising from the diminution of trade. Is of opinion that an extended copyright in designs would not benefit the class of individuals known in the trade as designers. Considers that the art of designing is much higher than it was seven years ago, and that it is at present improving. Thinks the best mode of extending and improving that art, is by having as free and open a competition in the article as you can; thinks under such circumstances the best and most talented man will command the best prices, and will take more pains to execute good designs, and he will take care, as far as he can, that every design shall excel the former one, knowing that an inferior design, will be of no use. There is a large class of designers in Manchester and the neighbourhood; it is a difficult matter to ascertain the exact number, but he should think there are about five hundred in Manchester and the district around. Thinks in the event of an extended copyright, they would all try to work their patterns 12 months; instead of three months, they should try to work them the whole of the time, and by that means there would be less occasion for so many designers, and consequently a great number would be thrown out of employment. That is, if he could make a pattern endure for a longer period than at present, he would require fewer designs would require less assistance in the production of designs from those parties, whose business it is now to produce them in larger quantities. Should state that to be the case not merely with reference to himself, but in the aggregate; thinks it must be so, for it affects one as well as another. There is a great degree of labour necessary in copying minutely; should say that tracing a pattern for a copy is a more tedious and unpleasant operation than designing an original as it is called. Considers that the extra time required to copy a pattern so minutely as to produce a *fac simile*, would be such as to render the production of the copy equally as expensive as the original design, and it might be more so. The confidence with which he deals with designers will unquestionably be in proportion to the freedom of the trade. Should say even now he has great difficulty, in fact he cuts very few of the purchased patterns, fearing the difficulties he might get into; but if the copyright were extended, he should seldom cut a pattern from any designer unless he had every confidence that there was something he could depend on. He alludes to patterns purchased from the open trade—those who live by going from house to house selling patterns, of which there are a very large number in Manchester. Should think that the present designers, of whom there may be about 500, would produce upon the average 20 patterns a-week each; that would be half a million, in round numbers, in the year. Goes from the calculation he makes of his own designers in this estimate. The printing trade is of growing importance; thinks it is growing in the number of pieces of prints actually produced. They had a considerable depression for some time back, which is not to be taken as a criterion of the trade; leaving that out, thinks the print trade is healthy and increasing. Is of opinion that an extended copyright would not benefit the public; thinks there is no doubt—inasmuch as monopoly or protection means an extra profit—the public would have to pay dearer for what they purchase than they do now; therefore the public would be sufferers. There would not be a free competition to bring down the profits to the scale which belongs to other business. It is true there would be competition as to style, and competition in every respect, except as to the specific pattern for which the twelve months' protection was granted. But thinks, inasmuch as there would be more protection, the public would

be worse served. The printer would have a longer time to reap the benefit of the protection. Conceives that an extended copyright would injure our foreign trade; in the first place, by giving the foreigners a decided advantage over us, in permitting them to copy, and us not; it is tying our hands behind our backs completely, and giving them full liberty to use our patterns as they please; we already hear of considerable interference with our goods in different markets. Presumes there will be an extra price if there is an extra protection, and that will enable the foreigner to compete much more easily with us than he is doing even now. Should say that the printing trade differs widely from many other branches of trade; for instance, the spinning trade; a person there does not require taste or skill, if he gets his mill, and gets a few persons to manage it, and so on; but the printer must have taste—he must have skill. There are many things required in the print trade which are not required in other trades, in order to ensure success; has not known a single instance where those requisites have been combined, in which they have been otherwise than fortunate. Should say that in every instance of failure it can be traced to a deficiency of means, of taste, or of skill.

(To be continued.)

DR. LARDNER DEFENDED FROM TREBOR VALENTINE'S MIS-READING.

Sir,—A correspondent under the above signature, in No. 893, *Mech. Mag.*, quotes (for the purpose of proving its incorrectness) a paragraph from page 7 of Dr. Lardner's "Steam Engine Illustrated," the latter clause of which Trebor Valentine makes to run thus—"this double journey of 190 miles is effected by the mechanical force produced in the combustion of *a quarter of a ton* of coke, the value of which is *six shillings*."

On referring to Dr. Lardner's work, I find he says, "this double journey of 190 miles is effected by the combustion of *four tons* of coke of the value of about *five pounds*."

Now, as Trebor Valentine acknowledged he had the book open before him at the very page from which he mis-quotes, he must be guilty of *wilfully mistaking* what the Dr. says, or else he is a most careless critic.

Yours, &c.

VULCAN.

Brighton, Oct. 6, 1840.

YSTALYFERA ANTHRACITE IRON.

A series of experiments have recently been made at Messrs. Whitworth and Co.'s works by Mr. Richard Evans, Manchester, upon the strength and other properties of the Anthracite irons of the Ystalyfera Company, with a view to ascertain their properties in relation to other irons. In submitting the results of about 280 experiments upon rectangular transverse bars, Mr. Evans modestly observes, "I trust that they may be considered rather as a series of elementary experiments upon a metal now so much occupying the attention of scientific and practical men, and a beginning to be continued and compared by abler investigators."

Mr. Evans has judiciously adopted the methodical arrangement of Messrs. Fairbairn and Hodgkinson, as being in all respects the most satisfactory, and where comparisons are made he has estimated the qualities of the Anthracite iron by their results.*

The trials were confined to the transverse strength of one-inch rectangular bars, with their several values, as under:—1st, specific gravity; 2nd, modulus of elasticity; 3rd, transverse strength of one-inch rectangular bars, 4 feet 6 inches apart; 4th, transverse strength of one-inch rectangular bars, 2 feet 3 inches apart;† 5th, ultimate deflection; 6th, power to resist impact, of which the tables are divided into, and contain bars broken from

72 specimens of No. 1,
65 ditto of No. 2,
61 ditto of No. 3,

all cast horizontally in sand, melted by coke from the cupola in the usual way; 44 specimens of bars melted as above, of equal mixtures of Nos. 1, 2, and 3; 24 specimens ditto, of the same melting and mixture, but afterwards planed down to a perfect one-inch square gauge; and 16 specimens ditto, of the same mixture, but melted in the crucible.

The melting furnaces were carefully cleared out, previous to the iron being put in, and the workmen enjoined to proceed with *care* in the casting, at the same time not employing any other than the usual method of melting, &c., so as not to disturb the ordinary condition or routine of iron casting. The bars were then well cleaned of the sand, and broken upon strong cast-iron standards, with a weight holder, fitted up especially for the purpose; and as evidence of the solidity, &c., of the whole, when the *distances* were carefully measured at the terminations of the experiments, *no* difference could be detected. The weights also were adjusted previous to use, with a sufficient quantity of small ones prepared, such as one, two, and three pounds, being essential to accurate results; and it

* Published in the sixth report of the British Association.

† The 2 ft. 3 in. bars are reduced to 4 ft. 6 in., as being a fair method of obtaining a more correct mean; a separate column in the tabulated form being set apart for them.

will be as well to state, that many of the fractures were made with weights not exceeding these sizes, frequently with one pound, which enabled the experimenter to mark the ultimate deflections of some of the bars with a load approaching very near to the absolute breaking weight.

The following table comprises a summary of all the experiments made by Mr. Evans on the different kinds and conditions of Anthracite iron, together with those of other irons from Messrs. Fairbairn and Hodgkinson's list:—

Summary and Comparison of the Total Mean Results from all the Tables, together with the same from Messrs. Fairbairn and Hodgkinson's List.

Number of experiments 4 ft. 6 in. between supports, and 2 ft. 3 in. bars, reduced, to 4 ft. 6 in.	Specific gravity.	Modules of elasticity in lbs. per square inch, or stiffness.	Breaking weight in lbs. of bars, 4 ft. 6 in. between supports.	Breaking weight in lbs. of bars, 2 ft. 3 in. reduced to 4 ft. 6 in.	Mean breaking weight in lbs. (S.)	Ultimate deflection of 4 ft. 6 in. bars, in parts of an inch.	Power of the 4 ft. 6 in bars to resist impact.
Mean of 72 on No. 1	7.093	13970644	444	445	444.5	1.843	821
Do. of 65 on No. 2	7.120	14544293	494	499	496	1.632	811
Do. of 61 on No. 3	7.130	16622197	531	537	533	1.640	916
Do. of 41 on equal mixtures of Nos. 1, 2, and 3.	7.110	15200982	465	479	471	1.553	749.7
Do. of the same frm. the crucible, No. 16	7.190	14894800	551	597	574	1.625	901.2
Do. of 24 of equal mixtures as the 41, but plan'd	7.110	14676771	533	539	536	2.447	1318.1

Forty-seven Specimens from Messrs. Fairbairn and Hodgkinson's Tables of Nos. 1, 2, and 3, as under:—

No. 1. 10	7.032	14132994	433	428	430	1.597	694
No. 2. 25	7.029	14570118	435	443	439	1.626	711
No. 3. 12	7.122	17683712	478	487	483	1.374	685

Summary of the Mean of the One Hundred and Ninety-eight Results of the three Qualities of Anthracite, and the Forty-seven from Messrs. Fairbairn and Hodgkinson's List.

198	7.114	15045711	489	493	491	1.705	849
47	7.060	15462274	448	452	450	1.582	696

In making a comparison of the same numbers of the Anthracite iron, and those which are comprised in the latter 47 results, the three first of the six only, contained in the preceding table, must be taken, the other specimens being on iron, under other

conditions, containing the mixed, planed, and crucible results, &c., the final mean of which is given in the last table—which taken singly, or collectively, show a superior value in every column in favour of Anthracite iron as compared with the most numerous list of other makes;* the most prominent of which are *strength*, *deflection*, and *impact*. And it would appear that the No. 1 is the most uniform in texture, &c., having the greatest fluidity and softness and lowest specific gravity, and for its strength, which is the weakest, it is most to be relied upon, as far as it extends.

The No. 2, less uniform a little in texture and strength, fluidity, &c., but of higher specific gravity, and stronger than No. 1.

The No. 3 still less to be depended upon in the above qualities, but of increased specific gravity and strength to the No. 2.

The equal mixtures show a deterioration of the several Nos., compared to their values separately, and the same as regards specific gravity. The same, but cast from a crucible, exhibit an improved list of values, including a greater specific gravity.

The planed bars show an increased strength above the same metal in the black bar: this is the only specimen whose strength is increased, without the specific gravity being greater also, which must be due to the planing, and not any alteration of metal, &c.

It may be inferred from the whole of the tables, except the last, that the higher specific gravity exhibited by the iron, the greater the strength.

* Except that of modulus of elasticity.

GLEANINGS FROM THE PROCEEDINGS OF THE GLASGOW MEETING OF THE BRITISH ASSOCIATION.

(Chiefly from the *Athenæum* Reports.)

(Continued from 363.)

Animal matters in Mineral Waters contain in great abundance a species of conferva, which in its structure resembles a species of *Oscillatoria*; it collects in large quantities around the sides of the wells, and, with deposits of inorganic and animal matters, forms layers of a dark green, white, and rose colour. In decomposing, these plants give out a more powerful odour than the water itself, a circumstance which has given rise to the opinion that a sulphuret of azote exists in these waters. These plants are peculiar to sulphureous waters, and probably have their existence determined by the sulphuretted hydrogen they contain. Throughout a large district in the neighbourhood of Askern, springs of water arise impregnated with sulphuretted hydrogen, and the soil around becomes saturated with it. In places where water runs over or collects on the soil, deposits are frequently seen varying from a light pink to a beautiful rose and carmine colour. These deposits rapidly appear and disappear, and have been found by the author to depend on the presence of two species of animalcules. One is oblong, with from two to ten stomachs, about the $\frac{1}{10000}$th of an inch long, and with rapid movements; the other is much longer, having about the same number of stomachs, and in its motions and shape very much resemble a *Vibrio*. The first resembles the *Astasia hæmatodes* of Ehrenberg, but it does not possess a tail, which is a characteristic of the genus *Astasia*. This animalcule was found, by Ehrenberg, forming a blood-coloured sediment in a lake on the Steppe of Platow in Siberia. These animalcules live in water artificially impregnated with sulphuretted hydrogen: they have never been seen in any place where sulphuretted hydrogen did not exist, and in many instances the author has been able to detect this gas by their presence, in places where he did not suspect its existence.—(*Dr. Lankester.*)

The Head and Heart.—Any reference to the affections and emotions brought a leer of incredulity on the countenance of the utilitarians, who suppose that when man begins to feel he ceases to reason. Give them, however, their darling arithmetic; let them have the osteology of their figurate skeleton; they are a species of naturalists, whose love is entirely confined to dry specimens, and who had no regard for the living animal moving in life and beauty. They are like those members who used to quit the house of parliament when Burke was speaking, as if they believed that where there was brilliancy of expression there could be no substratum of argument. They dissevered the association which the ancient Greeks had established between the two great ideas of their philosophy, uniting in one word, το καλον, the notions of truth and beauty, showing that they recognized nothing to be true which was not beautiful, and nothing to be beautiful which was not true. He trusted that the disseverance of these notions would not be perpetuated, but that we should all unite with common affection to erect a common shrine for the common worship of moral loveliness and moral truth.—*Dr. Chalmers.*)

Preservation of Iron from Oxidation.—The extensive and rapidly-increasing applications of iron to public and private structures of all kinds in which durability of material is a first requisite, have made it highly desirable to possess accurate information respecting the nature of the chemical forces which effect the destruction of this hard and apparently intractable metal. The preservation of iron from oxidation and corrosion,

is indeed an object of paramount importance in civil engineering. The Association was therefore anxious to direct inquiry to this subject, and gladly availed himself of the assistance of Mr. Mallet (of Dublin), a gentleman peculiarly qualified for such investigations, both from his knowledge as a chemist, and from his opportunities of observation as a practical engineer. An extensive series of experiments has accordingly been instituted by him, with the support of the Association, on the action of sea and river water, in different circumstances as to purity and temperature, upon a large number of specimens of both cast and wrought iron of different kinds. These experiments are still in progress, and the effects are observed from time to time. They will afford valuable data for the engineer, and from the principal object of the inquiry, but a period of a few years will be required for its completion.

(To be continued.)

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

Sir William Burnett, Knight of Somerset House, Middlesex, *for improvements in preserving animal, woollen, and other fibrous substances from decay.*—Enrolment Office, September 19, 1840.

This invention consists in the application of the chloride of zinc to the purposes specified. A wooden or other cistern is to be two parts filled with a solution of chloride of zinc in cold water, made by adding 1 lb. of the salt to every 5 gallons of water; after the solution has stood from 10 to 12 hours it is ready for use. The articles to be preserved, are to be pickled in this solution from 48 to 56 hours, according to their size, substance, &c.; they are then to be taken out and dried under cover, which completes the process.

Charles Keene, of Sussex-place, Regent's Park, Middlesex, Gntleman, *for improvements in producing surfaces on leather and fabrics.*—Enrolment Office, September 23, 1840.

This improvement consists in the application of a flexible water-proof surface to leather, &c., by means of Indian-rubber. The process is described as follows; take 100 lbs. of Indian-rubber cut into small pieces, and saturate it with 200 lbs. of turpentine, or other known solvent, for about 24 hours; then pass it several times between a pair of rollers set nearly close, sifting lamp black or other colouring matter on to it till the required hue is obtained; when the whole mass is of the consistency of stout dough or putty, it is to be put into a reservoir of water ready for use. The leathers to be operated upon should be uniform in size and thickness; a pair of rollers having been adjusted to suit the thickness of the skins and the quantity of pulp to be laid thereon, the upper roller is supplied with a damper of water to keep it continually wet, and thereby prevent the adherence of the India-rubber to the roller. A skin is placed with its edge between the rollers, and the operator having wetted his hands, takes a sufficient quantity of the India-rubber to cover the skin, laying it across the skin in contact with the wet roller; the rollers being then turned, the skin passes through them, receiving a smooth coat of the flexible and waterproof material upon its surface, which becomes thoroughly pressed into the fibres and pores of the leather. When dry it may be embossed or gilt in the usual manner. In order to remove the adhesiveness of the caoutchouc, shell-lac is to be dissolved in spirits of wine, with a small quantity of Venice turpentine, or other material, and two or three coats given to the leather. When dry, the leather thus prepared may be passed between embossing or plain rollers, or may be pressed between engraved or smooth metal plates.

The claim is, first, the mode of preparing external surfaces of leather, and fabrics made therefrom, with India-rubber (more or less dissolved) as a finished dressing as described. Second, the mode of employing water on the surfaces of rollers, when spreading India-rubber on to the surface of leather, as above described.

George Richards Elkington and Henry Elkington, of Birmingham, *for improvements in coating, covering, and plating certain metals.* Enrolment Office, September 25th, 1840.

Four separate processes are claimed as constituting these improvements, which are set forth at great length in the specification; they are briefly as follows:—

1. A mode of coating copper and its alloys with silver, by fusing silver on the surface of the metal, whereby the silver becomes alloyed or united with the surface of the metal so coated.

The metal is first to be silvered in the usual manner, and then treated with a hot concentrated solution of nitrate of silver; it is then heated nearly to redness to get rid of the acid. A quantity of calcined borax is heated to the melting point of silver in an iron pot; the coated metal is moved about in the borax, and lifted out occasionally; when the borax runs off the metal, the process is complete. Any borax that may remain is removed by boiling the article in dilute sulphuric acid (one part acid to twelve parts water), and then the article is to be annealed, and its surface improved by boiling in dilute sulphuric or muriate acid.

2. Three methods of coating metals with

silver: first, by oxide of silver dissolved in prussiate of potass, soda, or other analogous salt, or in pure ammonia; secondly, by means of the foregoing in connection with galvanism; thirdly, by means of a solution of silver in an acid, forming a neutral salt, in connection with galvanism.

The metal being first silvered, is to be immersed in the following hot solution: to 3 lbs. of prussiate of potass in water, add 5 oz. of oxide of silver, and boil them together; but if a thicker coat is required than can be obtained by this process, the solution of silver should be allowed to cool, and the article therein immersed should be exposed to the action of a galvanic current, as in the electrotype process. Another mode is to employ a solution of silver reduced by an acid to neutral salt, acted on as before by galvanism.

3. Two methods of coating or plating metals with gold; first, by gold in the metallic state, or oxide of gold, dissolved in prussiate of potass, or other soluble prussiate, or analogous salt; secondly, by using the foregoing in combination with galvanism.

To 2 lbs. prussiate of potass dissolved in a gallon of water, add 2 oz. oxide of gold or metallic gold in a finely divided state, and boil half an hour. For a thin coating the article is to be simply immersed; for a thinner coating it is to be exposed to a galvanic current, in the solution, as before directed with silver.

4. A mode of coating iron with other metals, by first cleaning it in a peculiar manner as a preparatory process.

The iron is first to be freed from all grease, and kept in an electro-negative state during the action of the cleaning acid, which is composed of one part sulphuric acid to sixteen parts of water, into which the iron is immersed, until a black scale of oxide is detached from the surface, which will leave it perfectly bright; the iron is then to be immersed in the following solution while boiling in a brass vessel: 1 lb. sulphate of copper, 3 lbs. water, and 2 oz. dilute sulphuric acid. When taken out it will be thinly, but firmly and evenly coated with copper, and may then be further coated either with silver or copper by the process previously described.

Thomas Smedley, of Holywell, Flint, North Wales, Gentleman, *for improvements in the manufacture of pipes, tubes, and cylinders.*—Enrolment Office, Sept. 30, 1840.

This patentee claims, first, the mode of combining three, four, or more bowls, or rollers, for making, pressing, and elongating tubes, pipes and cylinders, without seam or joint, and without the use of a draw-bench. Unfortunately for him, his improvements are identical with those of Mr. Prosser, as described at length in our present number, and Mr. Prosser's being the prior patent, is, of course, the only valid one. The second claim, is for a new mode of constructing the mandril, on which tubes, &c. are made. In this case, the mandril is composed of three horizontal pieces, in such a manner, that on removing the centre, the remaining pieces are easily withdrawn.

Thomas Young, Queen-street, London, merchant, *for improvement in lamps.*—Enrolment Office, October 13, 1840.

These improvements are set forth in the following claims, viz.: 1. A mode of regulating the supply of oil to the burners of fountain lamps by means of floats, and cocks, or valves. 2. A mode of using bags or flexible vessels to contain the oil in fountain lamps, together with means of causing the oil to be expressed from such bags or flexible vessels. 3. A mode of applying a perforated plate at a position above the point of combustion of the wick of lamps, and thereby obtaining a more favourable application of air to the flame of the lamp. 4. A mode of improving the combustion and consequent flame of lamps, by applying a coil of wire round the flame.

In explanation of these claims, two different forms of lamps are described; they are both table lamps, of the pillar kind, with the usual argand burner. In the first the pedestal or base of the lamp contains a leather bag, enclosed in another of linen, of a pyramidal form, which forms the reservoir for the oil. A series of metal rings are placed one above the other, gradually decreasing in size, around the oil-bag, which serve the double office of keeping the bag in shape, and by their weight pressing upon the bag cause the oil to be forced up to supply the burner; this is also assisted by the sinking of the pillar of the lamp down into the pedestal. The oil-bag is affixed to a bent tube at the top of the pedestal, furnished with a cock and lever, from which a rod passes up the oil channel to the top of the lamp, and is there furnished with a small ball or float. The weight of the pillar of the lamp, and of the metal rings around the bag constantly pressing upon the oil, has a tendency to force it up to the top of the lamp, where its escape is uniformly regulated by the float acting on the cock before mentioned. In the other lamp the pillar does not slide in, but is attached to the pedestal, within which there are two flexible oil-bags; a series of swinging bars hanging from the upper part of the pedestal surround these bags and press upon their sides, the pressure being aided by spiral springs placed around the inside of the pedestal. In each case a column of oil is supported on a level with the burner; in the latter case, the cock and valve are both placed at the top of the pillar.

Two methods of supporting the perforated plate, above the point of combustion, are shown; the first is by resting it on a shoulder formed in a peculiar shaped glass chimney; the second is by means of thin metal standards. Finally, the mode of applying a coiled wire around the flame is shown; *the advantages* of which, as well as of the perforated plates, we must confess are much beyond our comprehension.

PRACTICAL HINTS ON ROOFING.

Nature covers the bodies and limbs of birds and beasts with feathers and hair, laid in small portions one under another, beneath which the creatures may freely move, carrying their roofs with them; and, she even provides many species of them with oil, to throw off wet the more effectually. Man, who is, in himself, so little provided against the inclemencies of weather, soon discovered nature's mode of roofing, and adopted it. Thatch, shingles, weather boarding, tiles, slates, lead, copper, have all along been used in this mode, with various degrees of excellence. Under all these, the building may settle greatly, and yet no water penetrate the covering.

The pretence of improved science, or of economy, now leads the unwary to adopt various kinds of cementitious coverings; these of a nature so rigid as to flaw with every jar and settlement of the fabric, and, with every accident, intercept the rain-water in its flow. The rays of the sun, the contractions of frost, keep all these fragile unaccommodating substances constantly in a broken state; that water, which by other coverings is thrown off, is with much avidity drunken by these; hence, all within the fabric is ruined. Houses thus roofed are as much exposed to the weather as birds and beasts would be, if their feathers and hair were plucked from their bodies, and were laid again upon them without order. In such roofs the laws of nature are violated; they cannot, therefore, be either scientific or economical. Frequent renewal cannot lead to economy; constant fracture cannot be security; the penetration of wet, and the destruction of the supports of a roof, cannot be freedom from danger. Even the construction of a roof flat, to be covered with lead, requires more skill and caution than are usually possessed by the makers of cement roofs; what success, then, can attend their inferior skill, guided by improper feelings, and worked with unmanageable commodities?

The makers of inflammable roofs should everywhere be prosecuted as public incendiaries. By the 47th section of the Building Act, roofs are directed to be covered with glass, copper, lead, tin, slate, tile, or artificial stone; if, then, in the metropolis, that description of civil liberty which requires that each man's property should be protected from consumption by his neighbours—if every inmate of a building should be preserved from jeopardy—what plea can be set up for covering roofs with bituminous tesseras, or with Jew's pitch?—*Specifications for Practical Architecture, by A. Bartholomew.*

THE "GREAT WESTERN" STEAM-SHIP.

Sir,—Your Magazine of Saturday, Sept. 5, contains a letter from "P. R. H.," dated "New York." The letter in question is written in so narrow and uncandid a spirit, that I cannot refrain, though in no manner connected with the *Great Western*, or her engines, from making some observations upon it. "P. R. H." appears to be labouring under some strange confusion of ideas, when he recommends "Observator" to make a journey to Bristol, to examine the engines of the Great Western in order to render an act of justice to Mr. Hall. Now what the alleged dilapidated condition of the columns, and other parts of the frames of the engines of the *Great Western* can have to do with Mr. Hall's condensers would puzzle any one to discover. It is most extraordinary that, "P. R. H." should take "Observator" to task for not making "himself acquainted with all the facts connected with the question," when "P. R. H." himself passes over the only question, which can connect Mr. Hall's name with the arrangement of the machinery of the *Great Western*, viz.: the condensers. In adverting to this part of the subject, "P. R. H." is either ignorant or uncandid, and in assuming the tone he has done in his letter, he is not the less culpable whether his suppression of the truth arises from one or the other of these causes. The engines of the *Great Western* have common condensers, and the vacuum is effected by the operation of ordinary injection; yet from the judicious arrangements made for changing the water of the boilers, they, the boilers remain in nearly as perfect condition, as when they first were put to work. In what way then can "Observator" owe Mr. Hall one more letter, in which letter, after having made a journey to Bristol to examine the engines, he is fully to acknowledge his error to Mr. Hall? In conclusion, allow me to say, that it is not to such cavillers as "P. R. H.," that the world would ever have been indebted for so noble a work of human skill as the machinery of the *Great Western;* and that in endeavouring to depreciate its excellence, he has shown how little he is capable of appreciating the difficulties attending such a construction. appears to have wholly lost sight of t

portant part the *Great Western* has sustained in being the first successful Transatlantic steamer that was able to sustain a continued intercourse between Great Britain and America.

I am, Sir, your obedient servant,

VERITAS.

London, Sept. 24, 1840.

MORE IRON STEAMERS.

Sir,—Having latterly seen so much stated in your Magazine, and elsewhere, of the progress which is being made in iron boat-building, it will not be out of place, perhaps, if I inform you that I had last week the pleasure of a trip down the river in one which has just been completed by Messrs. Fairbairn and Co., of the Isle of Dogs. I do not profess to know much of the relative speed of the boats on the Thames, but the *Rose* appeared to me to be uncommonly fast. She started from Greenwich with a number of Margate and Ramsgate boats, amongst which were the *City of London*, the *Duchess of Kent*, &c., all of which she passed with the greatest ease, although she was heavily burdened with masts and rigging for a sea voyage. From the remarks which were made on board by the builders and others, I gathered that this boat is 310 tons burden, and is intended to carry passengers and goods between Sydney and the Hunters' River, in New South Wales, to which place it is going in the course of a few days, carrying upwards of 120 tons of coal *to steam with*, in case of calms or foul weather. If all iron steam boats are built as strong as this one appears to me to be, it will soon cease to create wonder if we find iron floating to all parts of the globe.

I understand that the Messrs. Fairbairn have in progress another steam boat, of exactly the same dimensions, for the same destination, to be called the *Thistle*, besides numerous others for various parts of the world, so that we may soon expect to see our flag floating above *iron* in every known sea. Let foes say what they will, it is evident, from *the lead* taken by our countrymen in every department of mechanical science, that the sinews of Old England yet remain unshaken, and as a true Briton I hope they ever will.

I am, Sir,
Your obedient servant,

AN OLD READER.

London, October 14th, 1840.

NOTES AND NOTICES.

Diving Operations—Mr. Deane.—We have seen with great pleasure a prospectus of a work by Mr. John Deane, of Portsmouth, on "Submarine Recoveries, Relics, and Antiquities." It is a matter of notoriety among all who take an interest in such matters, that Mr. John Deane and his brothers were the first persons who brought the diving helmet to that degree of perfection, which has, in recent times, made the recovery of sunken treasures an office of such (comparatively) easy accomplishment. Neither is there any individual who has been more actively instrumental than Mr. J. Deane in those "recoveries" of which he now, with great fitness, purposes to be the historian. The work is to be embellished with coloured lithographic plates, some specimens of which accompanying the prospectus are very beautiful, and to all appearance drawn and coloured with great fidelity to nature. Intending subscribers may be obliged to us for adding, that Mr. Deane's address is North-street, Gosport, Hants.

The Propeller.—A vessel bearing this title is at present running between Blackwall and Greenwich. She is a small vessel of elegant proportions, built by Mr. Ditchburn, of Blackwall. She has two very pretty "steeple engines," made by Mr. Beale, of Greenwich, of 24 horse power, which work two broad iron "propellers," placed one on each side the boat. Their action is precisely similar to those patented by Mr. John Lee Stevens, of Plymouth, in 1828, and described at page 418, of our 9th volume. The only difference is, that Mr. Stevens employed three paddles, worked by a three throw crank, while, in the present instance, a single crank and one paddle is only used. The motion of the propellers on alternate sides of the vessel communicates a disagreeable rocking motion, while their intermittent blows on the water cause a vibration which is apparent throughout the whole of the machinery. As we know that this kind of propeller is an especial favourite with many of our readers, we would strongly recommend them to avail themselves of this opportunity of observing its action, and judging for themselves. The speed of the "propeller" is about 10 miles an hour, her steam pressure is 5 lbs. on the inch, and she makes 40 strokes per minute. The propellers cause a slight eddy in the water, but they leave no swell behind, which is an advantage (and we fancy the only one) over paddle-wheels. The great breadth required for the action of the propellers, is a very considerable drawback.

Portraits on Roman Coins.—In the earliest and more simple days of Rome the portraits of no living personage appeared on the public money; the heads were those of their deities, or some personage who had received divine honours. Julius Cæsar was the first who obtained the express permission of the Senate to place his portrait on the coins, and the example was soon followed by others. The heads of Lepidus and of Antony appear on their denarii, and even the money of Brutus, with the two daggers and cap of liberty, bears on the obverse the head of the man who killed his friend because he had assumed the regal power and authority. We have no evidence, however, that this money, which is of great rarity, was struck with the knowledge and sanction of Brutus; and it is possible that it is a posthumous coin.—*Akerman's Numismatic Manual.*

Spontaneous Combustion.—The result of the investigation that has been going on at Devonport, to ascertain the cause of the late fire, has ended in a discovery that it originated in the spontaneous combustion of a large mass of rubbish in a bin situated under the shed which covered the *Talavera*; thus doing away with the supposed charge of incendiarism altogether; and showing the necessity of placing the refuse of all combustible matters likely to accumulate, in places where combustion, should it occur, would not communicate with any description of buildings.

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MR. SAMUEL SEAWARD'S PATENT METHODS OF WORKING THE CRANKS OF STEAM ENGINES.

Fig. 1.

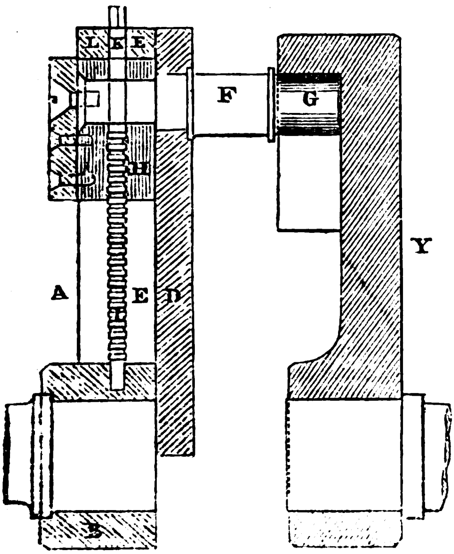


Fig 2.

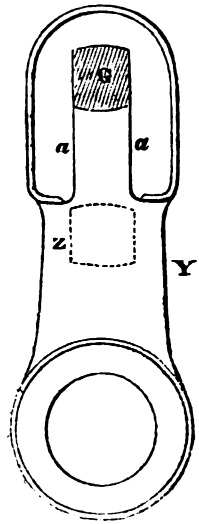


Fig. 3.

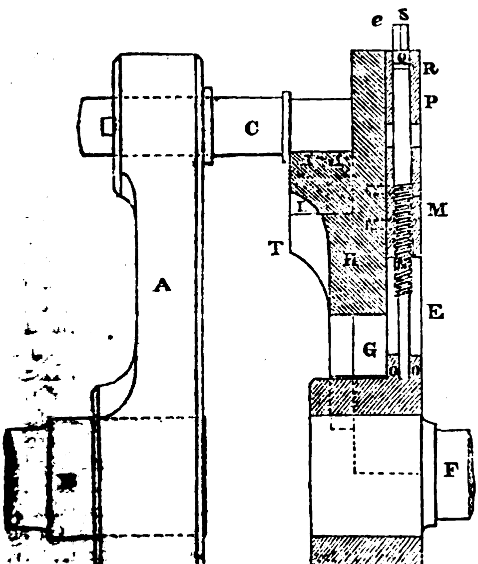
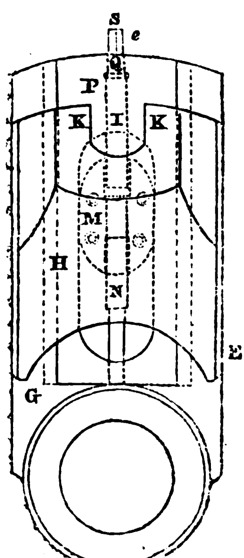


Fig. 4.



MR. SAMUEL SEAWARD'S PATENT METHODS OF WORKING THE CRANKS OF STEAM ENGINES.

We have already laid before our readers some of the improvements in the construction and application of steam engines, recently patented by Mr. Samuel Seaward; we now gladly resume the subject, and proceed to describe some very ingenious methods of working the cranks, which form the fourth, fifth, and sixth heads of Mr. Seaward's patent.

The first of these, as shown in figs. 1 and 2, is a mode of constructing cranks in such a manner as to admit of the stroke of the piston being lengthened or shortened at pleasure, and also to enable the paddles to be promptly detached from the engine. Fig. 1. A is the driving, and Y the driven crank; B is the main boss of the driving crank, by which it is firmly keyed to the main shaft of the engine; D is a strong slide fitted to the shank E of the driving shaft, which carries a projecting pin F, the toe of which (G) passes into a recess in the crank Y, and forms the connection by which the driving crank carries the driven one round with it. On the slide D a strong nut H is fixed, through which a strong endless screw I passes, which works at one end into the body of the crank at P, and at the other end into the shank E. J is a projecting square head, by which this screw can be turned round at pleasure; the screw is kept in its place by a pin L passing through the grove K. By this arrangement of parts it will be evident, that as the screw is turned to the right or the left hand, the slide D, with the crank-pin F, must approach to or recede from the centre of the main shaft C, thereby lengthening or shortening the crank, and consequently the stroke of the piston. To disconnect the paddle from the engine it is only necessary to turn the screw I until the crank-pin F and its toe G are entirely withdrawn from between the cheeks *a a* (fig. 2) into the open space Z, when the two cranks—and consequently the engines and paddles—are at liberty to move independent of each other.

Another mode of instantly detaching a driving from a driven crank is shown by figures 3 and 4—where A is the engine crank, B the main shaft, C the crank-pin, with its projecting toe D flattened on its sides; E is the paddle crank, F its shaft; H is a strong slide affixed to the shank G, having an open jaw I, with two parallel sides K K (fig. 4). The depth of this jaw clear of the shank G—that is, from L L, fig. 1—is such as to correspond exactly with the length of the toe D. M is a strong nut, attached to the slide H, through which an endless screw N is placed, the inner or lower end of which is housed in the body of the crank E at *o o*, and the other in the upper part of the shaft at P. This screw is kept in position by the pin R working in the groove Q. On turning the screw, the jaw I is caused to recede towards the centre of the crank E till it attains the position T, when the crank-pin D is liberated, and the two arms of the crank revolve independently of each other.

A third method of accomplishing the same object is shown by Figs. 5, 6, and 7: A is the driving, and B the driven crank; C the main crank-pin, with its projecting toe D; E the engine, and F the paddle shafts; G is a moveable circular head, inserted in the boss H at the end of the driven crank. On the inner end I of this head a strong screw *f f* is placed, taking into a nut K at the back, by which the head can be firmly secured to the driven crank B. Figs. 6 and 7, *c d* are quarter circle grooves in the boss H, in which the stops *a b* attached to the circular head move, so as to confine its movements to the quarter of a circle. L L is a recess in the form of the segment of a circle cut out of the circular head G for the reception of the toe D of the main crank-pin, and corresponding with it in depth and diameter. According to the position given to this circular head G, this recess may either coincide with, or cross the plane of rotation of the crank-pin. In fig. 6 it is shown as coinciding with it, allowing it to revolve freely without interfering with the paddle shaft. In fig. 7 the head G is turned a quarter round, and the recess L L no longer coincides with, but crosses the path of the crank-pin D, which therefore becomes fixed in the recess, and firmly connects the paddle-wheel shaft by its crank B to the engine shaft A, for all the purposes of propulsion. In order to change the position of the head G, all that is necessary is to slacken the nut K,

Fig. 5.

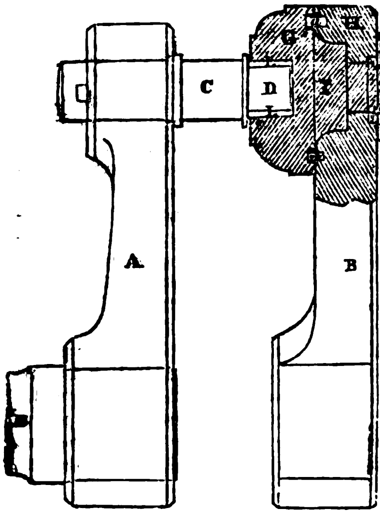


Fig. 6.

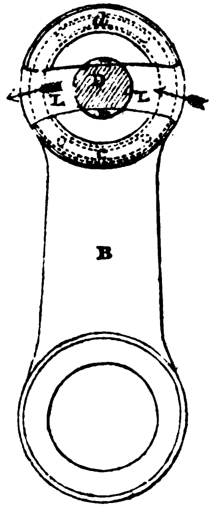
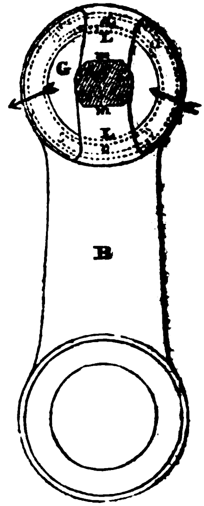


Fig. 7.



turn round G one-fourth of a circle, and then tighten the nut again. The toe pin D is flattened a little at the sides *m m*, in order to give greater clearance for the groove in the circular head.

From the great advantages afforded by these simple modifications in the construction of engine cranks, and the very liberal terms upon which Mr. Seaward proposes to license their use, we suspect that their employment will at once become universal.

ON THE THEORY OF THE INHERENT ACTIVITY OF MATTER—MR. WIGNEY IN REPLY TO MR. PRATER.

Sir,—The absence of Mr. Prater from home for three or four months, has induced me to refrain from replying to his letter, inserted in No. 880, page 35, of your work, until his expected return.

The opinion expressed by the philosophical friend of Mr. Prater, that "all matter seems to have elasticity when compressed, and on the pressure being taken off, it of course moves," I cannot coincide with, nor can I believe in the doctrine of innate repulsion, as possessed by bodies, or the atoms of which they are composed. That many bodies are elastic, is both evident and indisputable; and that when the pressure to which they have been subject, and which has caused their compression is removed, they will resume their original bulk or volume is plain; but I think it is not the result of "inherent activity," as possessed either by the body or the atoms of which it is composed.

As an illustration, I will refer to the condensation, or the compression of a large bulk of air in the chamber of an air-gun. In this operation, the air which is forced into the chamber by the piston, and retained therein by the valve, the elasticity of the air forcing the valve to its seat, is composed of ponderable atoms which cannot permeate the metal of which the chamber is formed, and of the imponderable atoms of caloric which are able to permeate; and the result of the operation is, that the whole of the ponderable atoms which are forced into the chamber are retained there, occupying a much smaller space as to position, than heretofore; and the greatest portion of the imponderable atoms of caloric which are forced in, are also forced out, by exudation through the metal composing the chamber. It appears to me, that the Creator of all things has ordained, that when a definite amount of the two classes of ponderable atoms—oxygen and nitrogen, are mixed together, that then a definite amount of the imponderable atoms of caloric shall unite with them, by

(what I would term) the law of constituency; and being blended, the composition is pure air. It also appears to me, that not only will a definite amount of caloric, impelled by the force of this constituent law, unite and be blended with the definite amount of oxygen and nitrogen, but it will mix with them agreeably to geometrical rule, and separate the ponderable atoms to a proportionate distance from each other. Conformably then with this view of the subject, we have in the chamber of the air-gun, after the process of condensation is completed, the definite proportion of the atoms of oxygen and nitrogen, but not the definite amount of caloric, and the ponderable atoms out of their constituent position as effected by pressure. And what is needed, to produce the combination of the original amount of constituent caloric, with those constituent ponderable atoms, and to cause them to resume their constituent position? Nothing but amplitude of space; and if the valve is opened, the constituent caloric will rush in, expand the ponderable atoms to their original position, and the celerity of the combination and the expansion, will furnish the mechanical force resulting. And if this view of the subject is correct, the elasticity of air is not due to the inherent activity of its atoms, but to the constituent power of combination with which caloric is invested, to unite with ponderable atoms to a definite amount, when they are blended in definite proportions, by the law of affinity and the power of attraction.

Mr. Prater states, that the great object of his former paper, was to apply *the fact of repulsion*, as being the cause of the diffusion of the gases, and observes, that "if any one replies, this is obvious; I shall maintain that obvious as it is, the idea does not seem to have occurred, either to Drs. Dalton, Mitchell, Stevens, Professor Graham, or any one else, as far as I am aware." But I do not think that he will find any one readily prepared to come forward and say that such is a fact, much less that it is obvious, and therefore I think that he will be spared the effort of maintaining that such is the fact, or that such distinguished individuals did not conceive such an erroneous idea; but I think he will have much difficulty in proving to your readers that he did not intend to convey the idea to them, that repulsion is attributable to the inherent activity of atoms, and motion to repulsion.

Dr. Stevens's work on the blood, and Mr. Prater's "Experimental Chemical Physiology," I have not seen, and therefore cannot be in a situation to offer an opinion on their contents; but the cause assigned by Dr. Stevens, "latent attraction," to effect the passage of the oxygen of the air through a bladder to the carbonic acid confined in a vessel, and ultimately to effect a displacement, appears to me to be quite correct; and although I have no present time to spare for experimental pursuits, yet the observations which I have almost daily the opportunity of making, on the operation and results of vinous fermentation, and which furnish analogous evidence in support of such an opinion, leads me to the conclusion that his supposition is perfectly correct.

It is long since that I read in some work (the name of the author of which I forget,) that if wort, with which is blended a proper amount of yeast to insure a vinous fermentation, if exposed to the atmospere, is placed beneath the receiver of an air-pump, and the air is exhausted, that such wort will not be subject to vinous fermentation for the want of a sufficient supply of oxygen to support the process; and if this statement is correct, it implies, that without the impartation of oxygen to the wort subsequent to its composition, (by diffusion) that such a process cannot be conducted and that glass is impervious to oxygen. Taking it for granted, therefore, that the impartation of oxygen is absolutely necessary to effect the process of vinous fermentation, previous to its commencement and during its progress, I have reason to know that wood is pervious to oxygen, as many years since I conducted the process experimentally in an air-tight cask, in the head of which was an orifice, in which was inserted and luted, the head of an alembic, and the spirit conveyance pipe inserted and luted in a receiver, so that no air could gain access to the wort within the cask, and yet the process of fermentation was well and extensively conducted from the commencement to the end. If, therefore, the presence of a continued supply of oxygen were necessary to support the progress of fermentation, and atmo-

pheric air were not admitted, then must the necessary supply of oxygen, I presume, have been transmitted from the atmosphere through the pores of the wood.

I will avail myself of this suitable opportunity for the probable benefit of some of your readers who may be brewers, to inform them, that my motive for trying this experiment was to ascertain if wort in a state of fermentation in open fermenting tuns, sustained a loss of spirit during the process, as was alleged to be the case; and if by conducting it in hermetically closed tuns, such loss might be avoided, as it was affirmed it might be; and the result of the operation was that no spirit was brought over into the receiver, and nothing but water and carbonic acid gas.

It may be desirable to notice here, that the presence of a definite amount of thermometric heat in the wort is absolutely necessary to enable the oxygen of the atmospere to combine with the carbon of the wort; and that the greater the amount of heat present, within certain limits, the more rapid and extensive will be the transfer of the oxygen. And again, the higher the thermometric temperature of the atmosphere, the greater is the facility with which the oxygen will be imparted to the wort; and thus we find that attraction between the atoms of oxygen and carbon, aided by the expansive power of heat, is the most probable cause of the gaseous diffusion, instead of an inherent repulsive power possessed by the particles of matter as Mr. Prater imagines.

Another illustrative proof is furnished by vinous fermentation, that heat is not only the primary and co-operative cause of the formation of gases, but also of their diffusion; I allude to the creation of carbonic acid gas in wort subject to such process, its subsequent expulsion therefrom, and its final diffusion throughout the atmosphere. In the formation of such gas, we trace the elementary and necessary conditions to effect its subsequent diffusion; for, as carbonic acid gas is heavier than atmospheric air, both being of the same thermometric temperature, so is it necessary in order that its diffusion throughout the superincumbent atmosphere may be effected, that the thermometric temperature of the gas, at the period of its evolution from the surface of the wort should much exceed the thermometric temperature of the atmosphere; and thus for the formation of this gas within the wort, its ascension to the surface and its ultimate diffusion throughout the atmosphere, we find an abundant supply of thermometric heat, resulting from the liberation of latent heat, set free by the decomposition of the wort, and the decomposition of that wort effected by the affinity subsisting, and the attraction exerted between the carbon of the wort and the oxygen of the atmosphere—their union being aided and facilitated by thermometric heat.

The superfluous observations of Mr. Prater relative to an indirect partiality for the "occult sciences," &c., may be intended as dust for the eyes of your readers, but I trust that there are some who will think that "the accuser is the transgressor," and whom he will find it very difficult to persuade that inherent activity, or inherent repulsion, is not an imaginary force, and that of his own conceiving.

Mr. Prater is quite mistaken in his supposition that I used the term *diffusion* as synonymous with the term *expansion*, for in making the statement, "and finally, the expansion (diffusion) or contraction of gases, is alone attributable to the impartation thereto, or the abstraction therefrom, of caloric" I placed the word *diffusion* in parenthesis, under the idea that Mr. Prater had erroneously used such term, instead of the term expansion; because by his mode of reasoning he appeared to me to be endeavouring to establish the opinion, that the expansion of gases was due to the inherent activity possessed by the atoms of which they are composed; and my object was to prove that it was attributable to the impartation of heat. If he had made use of the term admixture of different gases instead of the term diffusion, to convey his meaning, I should neither have endeavoured to show the cause of their expansion, or parenthetically written the term diffusion.

Immediately following his notice of the term diffusion, Mr. Prater states, "We all know a gas expands when heated, but when carbonic acid and oxygen, or air, are merely left in juxta position (*without being heated at all*) they still gradually

mix." And then follows his question, "How then does the impartation of caloric explain the mixture in this case?" Now from the explanation which I have just given as to my misapprehension of his meaning and intent in using the term diffusion, it will appear evident that I did not attempt to attribute the admixture of different gases of different specific gravity, to heat alone, and their admixture contrary to the law of gravity, when a gas of least specific gravity is superposited on a gas of greater specific gravity; and as it is to be presumed that Mr. Prater read that part of my letter, wherein I endeavoured to account for the amalgamation on the principle of affinity subsisting, and the power of attraction exerted between the constituent ponderable atoms of each gas, his question appears to me to be quite superfluous. And although I made no allusion to heat as being an accessary cause in producing the effect of admixture, yet I am decidedly of opinion that it does so operate, although Mr. Prater states that carbonic acid and oxygen, or air, will gradually mix without being heated at all; for in addition to the example which I have already furnished, with respect to the conversion of carbonic acid formed in wort in the state of fermentation into carbonic acid gas, and its final admixture with, and diffusion throughout the atmosphere, as induced by the liberation of latent heat, resulting from the decomposition of the wort, I may observe that I see no reason why carbonic acid may not be gradually blended with the atmosphere, and consequently displaced from the vessel, as well as that water of much greater specific gravity should also be mixed with it by the process of evaporation, the impartation of natural heat to the carbonic acid, or the reduction of the temperature of the atmosphere below that of the carbonic acid, being sufficient in either case to effect the admixture.

Mr. Prater complains of my advancing opinions hypothetically, and stating occurrences as most probable; but it appears to me to be much more consistent to furnish doubtful opinions on controversial subjects, and such as will not furnish positive and indubitable proof, than first to imagine an evidence, and then boldly to assert it as a proof of a fact; and before Mr. Prater undertakes to say what it appears to him to be incumbent on others to do, it would probably be better for him to examine more carefully and attentively the evidences which his experimental pursuits furnish, and to reflect more deeply before he deduces his positive conclusions as to the cause of the effects produced.

When I read the title of Mr. Prater's essay, "On inherent activity as a property of the particles of matter unrestrained by cohesion, atmospheric pressure, or other forces: Demonstration, that this property is adequate to the explanation of the diffusive power of the gases," and read all the remarks which he made, and examined the evidences which he adduced in support of his theory, it appeared to me that he really did not believe in the "*vis inertiæ* of matter;" for in the first place, he noticed the motion of matter in mass, when floating in water, and attributed it to the inherent activity of its atoms in aggregate combination in the form of powder, making a distinction as to the difference in the force of such power, as dependant on the bulk of the mass, or in other words, attributing to atoms the property of inherent activity, subject to gradual and final extinction, in proportion to the amount of their aggregate combination. Now, there appears to me to be a singular inconsistency in the supposition that atoms are invested with the power of inherent activity when not in combination, and that such power should become extinct on their becoming united, to some definite extent as to number, and after having lost such power, I should much like to learn from Mr. Prater from what source they are enabled to resume it, when they are again subject to ultimate division or separation?

It appears to me that Whatley is perfectly right in his conclusion, that the heterogeneity of particles is a cause of motion, but I do not conceive that either chemical affinity or attraction implies inherent activity, and in fact, I conceive that the term affinity is improperly used to denote that impulse which precedes attraction, and without the previous exercise of which the power of attraction cannot be called into action; for the meaning of the term affinity is, "kindred, likeness," and I should imagine was first adopted to express that desire

in atoms to unite, as may be supposed to exist between kindred beings, or persons of similar habits, manners, &c. But if we look to the meaning of the term heterogeneous, "unlike in Nature," and apply it to denote the division of atoms into classes, unlike in properties, tendencies, &c., and wish to express the tendency, desire or disposition which atoms of different classes have to unite with each other (such as oxygen and carbon, &c.), then we appear to need some conventional term, the meaning of which is in more accordance with that which it is intended to express, than the term affinity.

In concluding that the heterogeneity of atoms is a cause of motion, it is necessary in order to produce the effect, that atoms of different classes should be placed in proximity, and within the sphere of their separate or mutual power of attraction, and motion and union, proximate or close will ensue; but if you place atoms of the same class in proximity, no motion will ensue. In the first case the tendency, disposition or desire of the atoms to unite (termed affinity) and the power which they have to unite (by what is termed attraction), will prove superior to the *vis inertiæ*, (which otherwise would retain them in their position), and they will therefore move and unite. But in the second case, as no superior power operates upon them, they retain their position by the power termed *vis inertiæ*.

Mr. Prater appears to doubt that the evaporation of water at the ordinary temperature of the atmosphere, is attributable to heat imparted from the sun, because, as he observes, the evaporation occurs by night as well as by day, and I suppose he means thereby to infer, that as such impartation cannot occur at night from such a source, and as the evaporation still continues, so such cannot be the cause. But such an inference does not appear to me to be tenable, for the sun having imparted to the earth and its covering a large amount of heat in the course of the day, it needs but a reduction in the temperature of the atmosphere to render that heat returnable, agreeably to the law of equal diffusion to which heat is subject. Now this reduction generally occurs during the night, and therefore we find that a transition of heat from the earth and the substances which cover its surface takes place—that portion which emanates from water, carrying with it some of the ponderable atoms of which such water is constituted, and the compound which evolates or evaporates being termed vapour.

In relation to the evaporation of water *in vacuo*, before I offer any further observations on the subject, it appears to me to be necessary that I should point out a typographical error in the following sentence, in page 5 of my letter, "by the same law it rushes in among the atoms of which the air is composed," the word "air," should have been "water."

The evaporation of water *in vacuo*, which I attributed to the impartation of heat from the external atmosphere and surrounding media through the glass receiver upon the withdrawal of the air, Mr. Prater appears to question, because it is found that "so far from the temperature being increased in this case, there seems reason to believe that it is actually lower;" and he further adds, "so far from rising, a thermometer would probably fall when put into an exhausted receiver;" whence he appears to conclude that because an increase of thermometric temperature does not occur, such a transition of heat does not take place, and cannot therefore be the cause of the evaporation of the water. But Mr. Prater seems to lose sight altogether of the possibility or probability, and perhaps certainty, that the heat which thus enters becomes latent, because it enters agreeably to the dictates of the law of equal diffusion, which prescribes the entry to fill up the space which otherwise would be vacant upon the withdrawal of the air, and thus restore the equilibrium of distribution. And it should be remembered, that in exhausting the receiver of the air within, a large amount of latent heat forming a constituent of the air is also withdrawn, and which being constituent, and inseparable from the constituent ponderable atoms other than by pressure, or by abstraction in obedience to the law of equal diffusion, must therefore be withdrawn simultaneously. This abstraction then of the constituent latent heat of the air from within the receiver must necessarily cause the thermometric heat of the water to pass into the space above

to replace the latent heat abstracted; and by its transition a portion of the ponderable atoms of the water will be elevated with it, and together constitute the vapour which is seen to rise; and consequently the thermometric temperature of the water will be diminished, and indicated by a corresponding effect on the mercury in the tube of the thermometer; but this reduction in the thermometric temperature of the interior of the receiver, and the solid or fluid substances within, would, I apprehend, be but temporary, because by such reduction for the purpose of furnishing a quota of the requisite latent heat to fill up the space previously occupied by air, the temperature of such water or other substance would be reduced below the temperature of the external media, and such being the case, a transition of heat from such external media to the water or other substance within, would soon restore it to an equal temperature.

My reply to Mr. Prater's question, "Why, then, did not Mr. Wigney keep to the point of gases especially?" is, because I saw no sufficient reason why I should, and because I considered it more consistent to notice every example which he adduced in support of his theory, in the consecutive order in which he furnished them, and if my observations upon the subject of fluids were more extensive than upon the subject of gases, it was simply because his illustrations were more ample in that department.

As relates to Mr. Prater's observations on the circulation of the blood, they all appeared to me to be made for the express purpose of endeavouring to prove his belief that its motion is the result of the power of inherent activity, with which he supposes its atoms are invested; and whether his statements were decisive or not, my endeavour was merely to prove that such motion is attributable to the impartation of heat as a primary cause.

If Mr. Prater is determined to stand fast in his conclusions until he is refuted by experiments, I think that he will remain in that position long enough, for I can perceive no probability that any can ever be conducted that will afford occular or other demonstration even of the motion of atoms, much less of the power which causes it; and as upon such subjects we can only reason, without furnishing indubitable evidence, and offer conjectural opinions, without yielding proof, so must we finish where we began, and leave that which is yet a mystery as incomprehensible as we found it; and fearing that your readers will be much more weary than edified by the discussion, and thanking you for the insertion, and them for their patience, if they have read my portions of it,

I remain, Sir, your obedient servant,

G. A. Wigney.

Brighton, September 18, 1840.

POINTS BEARING UPON THE "NEW THEORY OF THE UNIVERSE," (PAGE 555, VOL. XXXII.)

Sir,—Five out of six of the three volumed works of the present day, are like flutes drawn out until they are flat enough to suit a certain number of other flat instruments which surround them. But the volumes have this advantage, they make no noise. There is more food for thought and ingenuity in one of your numbers than in a thousand of them. This is all as it should be. Your work is intended for the useful part of the community, the others for the idle part. Thus the value of time is properly cared for. If you approve of the following observations, you will oblige me by their insertion in an early number. Independently of my theory respecting motion, I cannot help viewing with great distrust the present system of trains of carriages on rail-roads, with their unequal distribution of weight. The wear and tear occasioned by one predominating force dragging, at an equal pace, vehicles so dissimilarly circumstanced must be enormous; to say nothing of the danger produced when the already wrenched material is again brought into use under altered circumstances. The only railroad I ever travelled on is the Great Western. We were four on one side and one on the other. Must not the carriage in which we were have received more damage than if the weight had been more equally disposed? I cannot believe (all things considered,) that more than one vehicle, be its size what it may, ought to be attached to one engine, not only on account of the greater

wear and tear, but also on account of the increased danger from concussion, the difficulty of accelerating and of arresting or checking the progress of a train being almost insurmountable. We have no examples in nature of various attached weights dependant on one moving form. I offer these observations as suitable to the present theory of motion. They would be equally proper with respect to my own. But that on some future occasion.

I remain, Sir, your obedient servant,

E. A. M.

October 1, 1840.

(From the Same.)

Sir,—I should esteem it a favour if one of your able correspondents, would (without adopting my theory,) tell me the reason why a billiard ball runs away when it is hit? To save the trouble of a reference, that part of my theory which bears on this question affirms the existence of fluids which traverse through the atmosphere in *every direction*. Without these traversing fluids I can find no rational cause for the continuance of motion in inanimate matter. As I am no mathematician I am desirous of having an answer to my question in plain English. You, Sir, are too well informed not to be fully aware of the great importance of this question. On it, as on a pivot, the most interesting experiments at present in hand by the philosophers of the day, may be said to hang, as well as the explanation of many things which are at present inexplicable. It is many years since so interesting a subject has been offered for the discussion of the scientific world; its very importance, appearing as it does from an unknown quarter, casts a kind of mist around it; but it is a mist that it will be well worth while to disperse.

I remain, Sir,

Your obliged reader,

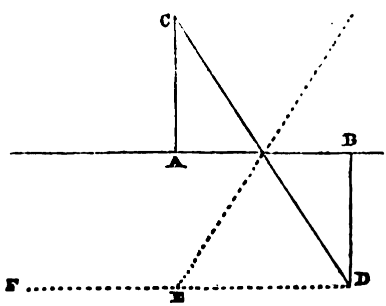
E. A. M.

October 10, 1840.

SCREW PROPELLERS SUPERIOR TO PADDLE-WHEELS.

Sir,—I have read in the *Mechanics' Magazine*, Nos. 892-3, some observations by Mr. Holebrook upon Smith's Patent Ship Propeller, and upon the Report published by Captain Edward Chappell, R. N., respecting the performances of the *Archimedes*, and the advantages attendant upon Mr. Smith's method of propelling steam-vessels. My attention has been directed to the subject by Mr. Holebrook's observations, and as I have arrived at conclusions diametrically opposite to those entertained by that gentleman, upon what seem to me very sufficient grounds, I feel persuaded that the impartial character of your publication will induce you to give insertion to the following statement, intended to do justice to a gallant officer, as well as to place the subject of propulsion by screws in a fair and proper light.

1. From the action of power in a screw being in a plane at right angles with its axis, or parallel with the base of a correspondent cylinder, the resistance arising from *inertia* must be overcome in a direction parallel with the axis. For instance, if A B, be part of the axis of a screw, C D, a part of its thread, B D,



at right angles to A B. Then, as in theoretical calculations of the resistance of fluids, the resistance arising from *inertia* is alone considered, if the screw were to revolve until C arrived at E, in the straight line D F, parallel to A B, any particle of water which was resting upon D, when the motion commenced, will be driven along by the action of C D, upon it, from D to E. When the screw does not move from its position, D E, is moreover equal to A B.

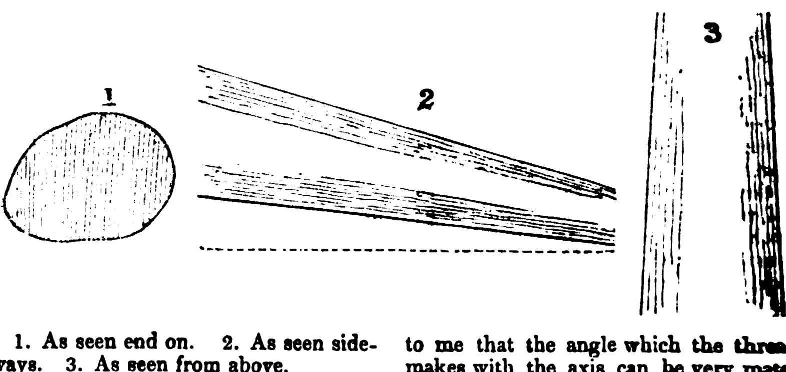
The *whole* power therefore, theoretically, would be directly exerted to move any floating body to which the screw might be attached in the direction A B. The resistance overcome by a screw of one turn is, in every revolution, equal to that overcome by a circular disc of an area equal to the area of the base of a

correspondent cylinder, minus the area of the axis of the screw, moving in the same fluid in a direction perpendicular to its surface, a distance in an equal time, equal to the length of the screw's axis. For instance, the axis of the screw of the *Archimedes* is parallel with the line of the vessel's keel, the resistance being overcome perpendicular to a plane at right angles with the axis, the whole power is directly exerted in the line of required motion: the result is, as if a circular disc of about 24 square feet were forced by the water in a direction perpendicular to its surface, a distance of 8 feet in the time required for one revolution of the screw, and *were there no slip*, the vessel would be propelled a distance of 8 feet by every revolution of the screw.

2. Practically there is nothing that can materially interfere with the foregoing deductions. There is no assignable cohesion among themselves of the particles of water; what there is, must in some trifling degree create a loss of power. Their cohesion to the surface of the thread of the screw, a cohesion increasing with the velocity of revolution, will add indeed to the weight of the screw, and to the amount of friction to be overcome, but will not affect the direction in which resistance operates. There would be communicated to the water thrown off a conical twirl, such as Captain Chappell has noticed, though I believe the divergence would be of very limited extent.

The difference of resistance offered to pressure upon a particle of water at any point upon the surface of the thread, has nothing whatever to do with the direction in which resistance is overcome; but there must be in consequence a lifting of the water moved, nearly equal to the diameter of the screw, keeping the posterior portion of the screw covered when above the level of the water's surface, thus aiding the continuance of its action on the ship.

Could we see the water thrown off, I imagine, from an attentive consideration of the several laws acting upon it, that there would be the following aqueous appearances.



1. As seen end on. 2. As seen sideways. 3. As seen from above.

3. So far from cutting away the inner parts of the screw, the only question seems to me to be *how far are the outer parts necessary?* If, for instance, two paddles or floats of a wheel of 12 feet diameter (which it seems is the size of wheel proper for the *Archimedes*,) are only of 14 or 15 feet area, it is probable the outer positions of the screw's thread might be advantageously cut away until the diameter is reduced to 4 feet 5 inches, the outer parts of the thread making an angle of 58 degrees with the axis.

4. Apart from its necessary connexion with the length of axis it does not seem to me that the angle which the thread makes with the axis can be very material. It is probable that further experience will show the propriety of varying the angle according to circumstances, since the same angle which might best suit for tug boats or ships of heavy burthen, may not be equally adapted to sharper vessels intended to proceed at higher speed. It is quite amusing to find Mr. Holebrook taxing captain Chappell with error, for stating the angle at 45 degrees, when the least reflection might have rendered it evident that Captain Chappell was speaking of the angle made by the *mean part* of the thread, and not of its *extremity*. The greater

the length of axis in one turn the less of course would be the angle, and *vice versâ;* but the less the length of axis, the greater the velocity of revolution necessary to drive the ship a given distance in a given time, and consequently the greater would be the cohesion. I do not conceive it would be advisable to go to a greater velocity than 170 revolutions per minute, but such a point, as well as the length and the angle, can only be decided by experience, and not by theory.

5. Mr. Holebrook seems to have theorized himself into sad confusion upon the subject of *slip.* A screw of one turn cannot advance more than the length of its axis in one revolution by any motion of its own creation; but Mr. Holebrook endeavours to persuade us, that as the outer portions of the screw of the *Archimedes* go through a space of 24½ miles per hour, in the average number of revolutions made by the propeller, the vessel would also advance that distance in a straight line if there were no loss of power. The absurdity of this hypothesis is manifest. Multiply the hourly number of revolutions 8,320 by the length of axis 8, and the amount gives the utmost attainable speed if there were no slip 10.9 nautical miles. Now in the tabular statement given in Captain Chappell's Report (which by the way is drawn up in a manner highly creditable to that officer, and peculiarly gratifying to any one desirous of information from the clearness of its arrangement,) we find that the *Archimedes* made an average speed of 8.8 miles an hour, consequently the slip is something less than *one-fifth.*

6. Mr. Holebrook cannot discover how the action of the screw should alter the position of the ship's head some points previous to her getting way, a fact attested by several most respectable and disinterested witnesses. Had Mr. Holebrook possessed the slightest knowledge of maritime affairs, he would have understood that the circumstance in question was occasioned simply by the rudder being inclined to port or starboard, at an angle with the keel, so that the stream of water thrown aft by the action of the screw, impinges upon the rudder, and thus acts as a lever upon the stern of the ship. If Mr. Holebrook's theory were correct, the fluid would never be driven near the rudder by the action of the screw, much less forced thus violently against it. The statement I have made, however, accounts for the result, as mentioned by Captain Chappell and many other naval officers, showing that resistance being overcome in a direction nearly parallel with the vessel's keel, and with the axis of the screw, the water will be driven nearly in a direct line astern, and with great violence.

7. It is asked, "might not paddle-wheels of 12 feet diameter with the same steam engine, drive the ship as fast as she goes with the screw, the wheels making 25 revolutions per minute?" I answer decidedly not. For the greatest possible distance a wheel can travel in a straight line when revolving, is equal to the length of its circumference; and unless it be dragged along it cannot go more: therefore, a vessel cannot be propelled by paddle-wheels a greater distance in 25 revolutions, than 25 times their circumference, which would give a possible distance of only 9.2 miles per hour, and estimating the slip at one-fifth, the *Archimedes* could not have gone more with paddle-wheels than 7.4 miles an hour, which is 1.4 mile per hour less than she was propelled by the screw.

Upon due consideration of all these points, therefore, it is evident—

1. That *there is scarcely any practically material loss of power arising from the action of the screw.*

2. That *the action of the screw is not only direct, but constant.*

3. That *there never can be such unequal lateral action as to shake the ship's keel, or to cause gyrations of her head,* as supposed by Mr. Holebrook.

4. That *the slip of the screw is less than one-fifth.*

5. That *the vessel goes considerably faster with the screw than the same steam engine would drive her with paddle-wheels.* Besides the wheels only act directly at one point; one is often immersed too much, and the other altogether out of the water; and both are occasionally immersed too much or too little, as the vessel may happen to be heavily or lightly laden.

In opposition to all these manifest advantages, added to those so clearly described by Captain Chappell, there is but one objection which appears to me of any force. Is not the orifice made in

the dead wood for receiving the screw, likely to weaken the stern frame of the ship? It is reported that several able ship builders have already submitted plans to Captain Chappell for obviating this objection, and "being a mere mechanical difficulty" it will probably be overcome; but as I had no other object in penning these observations than to elucidate truth, it would not have been consistent with such purpose to omit noticing any particular upon which I entertained a doubt.

The probability of a steam vessel ever being in a position in which a shot could strike the screw propeller is extremely slight, for a gun which could project a shot, so as to strike an object possibly at a depth of 12 or 14 feet under water, must I conceive be mounted upon a considerable elevation above the level of the sea, and be likewise in close proximity to the vessel. If it were not so elevated and so near, it could not be depressed so as to admit of the shot penetrating to the depth of the screw; so that, practically, Captain Chappell is correct in stating, that the propeller would be secure against shot, as circumstances could scarcely ever concur to place a vessel in such a situation as I have described. If Mr. Holebrook had thoroughly comprehended the system of *ricochet* practice, frequently adopted by the French during the late wars, he would not have presumed to question this opinion of so distinguished an officer as Captain Chappell, whose professional services must have made him more conversant with the principles of gunnery, than a mere landsman like Mr. Holebrook.

Finally, I must express a full conviction that the screw is in every point superior to paddle-wheels for the purpose of propelling a body in a fluid. Its collateral advantages also are so numerous, that it cannot be long before it comes into general use. One of the first engineers of this great engineering country has already declared in favour of Mr. Smith's invention. Ships of immense magnitude are adopting the principle in all directions; and notwithstanding the interested opposition of paddle-wheel projectors, or the *anonymous* fabrications of envious persons, it would be as easy for Dame Partington to stop an inundation of the Atlantic with her mop, as for the "small fry" in question to stay the progress of an invention, which will probably soon be ranked side by side with some of the greatest improvements introduced by the transcendant genius of WATT.

I remain, Mr. Editor, your obedient servant, and constant reader,

ROGER PHILLIPS.

Whitehaven, October 10, 1840.

IMPROVEMENTS IN BELL HANGING.

Sir,—The desire you evince to publish all things useful in your valuable periodical, encourages me to suggest, what I think would be an improvement in dwelling-houses. When the plasterer has done his part, the bell-hanger is usually called in to spoil his work, by making ragged unsightly holes, through which to conduct his wires. This is done by punches and long gimblets, to force passages through the walls, floors and ceilings, which are often so large, as to admit two or three fingers. Indeed, there was an instance some few years since in the environs of Liverpool, of much alarm being excited by the bells ringing without any apparent cause, till the discovery was made, of its being occasioned by mice passing through these convenient openings on visits to each other in their separate appartments. A very simple and neat contrivance might prevent all this, at a light expense, viz.: to insert in the brick work, in each corner where bells may probably be wanted, small tin or zinc tubes, not exceeding ⅛ inch bore. The expense would not be half-crown a house, the tubes might be easily cut off to any length, and be no eye-sore in any case. It would abridge the labour of the bell-hanger in the most disagreeable part of his work, where he has frequently to encounter a hard brick. The communication would be ready made to his hand by the brick-setters in an early stage, and the tubes plugged up where not wanted.

I remain, &c.

C. G.

Moville, Donegal, October 1, 1840.

TO CORRECT A SQUARE.

Take a square plate as broad as the square to be corrected is long. Apply the square to one edge, which mark, that

you may know it, and call it the first. Alter the second edge till it fills the square exactly, then apply the square to it and alter the third, which, being made correct, apply the square and make the fourth correspond unto it. Having thus made the four sides of the plate answer the square at the three corners, apply it to the fourth, when it will at once prove a true test of the correctness of the square. If on applying the square to the fourth corner, it answers without deviation to the fourth side and the first, it is an evident proof that the square is delicately true, since whatever deviation is manifested it is four times the real error of the square. This is evident, since each repeated application of the square adds its own error to the former.

Let those then, who have tested their squares by this method, alter their squares a fourth of the deviation, shown at the fourth corner. To come to the utmost exactness, they must repeat the operation as before described, till the plate corresponds with the square at every side, and the square with the plate at every corner. It is almost needless to state, that the operation must be performed by a good workman and with the greatest exactness. If the square to be tried be large, the square plate need not be solid, but made like a frame, which, having been made delicately true by the foregoing method, might be carefully preserved, and would serve as a true test by which to regulate all squares of smaller dimensions.

I have known some persons say that it was impossible to make a plate square, or to answer a square on every side, not considering that the deviation shown on applying the square to the fourth angle, having made it fit the other three, is owing to the incorrectness of the square itself, and not to the impossibility of performing the operation.

I remain, &c.

T. B. Darlington.

September 26, 1840.

SUBMARINE GALVANIC BATTERIES.

Sir,—Giving all due credit to Colonel Pasley for his use of the galvanic explosion of gunpowder under water, I would suggest, that instead of wasting so much powder as his plan must do—that a submarine battery consisting of guns of sufficient calibre should be substituted, whereby much more execution would be done, and certainly with much less danger. I need not say that the powder of the battery could be galvanically fired quite as easily as in the manner the Colonel at present uses it.

To show that this suggestion is feasible, I would observe that a solid substance forcibly projected against the materials intended to be dissevered would be much more effective than mere force of expansive matter, which can only be but very partially applied, as it must radiate in every direction.

Such a plan of using submarine explosions by means of guns or batteries placed vertically or otherwise, as occasion might be, would afford an excellent means of defence against vessels of war entering a port or harbour with hostile intention. It is free also from the objections advanced against the treacherous torpedo system propesed by the American Fulton, as it could only when it took effect, hasten the surrender of the approaching enemy. *

THE CALCULATOR, No. 10—CASK GAUGING.

Sir,—Your correspondent, "Nautilus" (p. 263) has certainly produced a very simple rule, which I am not prepared to say is not as good as, or for practice better than, that suggested by me. The *test* of experiment is alone applicable to a thing so arbitrary in its formation as a cask.

A theoretical objection, however, is this; that upon the supposition of B and H being equal, "Nautilus's" rule will give *less* than the true cylindrical content. Putting it into my general form, the values of x y z come out 1·9064, 1·05911 and 0 respectively; this sum falling short of 3, by 0·03449. And if the divisor 1000 be retained, it will make the co-efficient wanting = 0.03257, to be applied either to the product B H, or to some function of one or both of the separate quantities. In the particular example chosen by "Nautilus," the addition of a term ·00003257 L H^2 would bring the capacity almost exactly to the actual measurement; while that of ·00003257 L B H would make the content about *half as much* in excess, as without it, in defect.

In the Calculator, No. 7, I stated such

co-efficients as appeared best to satisfy Dr. Young's measurements collectively. But were it worth the trouble, I have little doubt that more than one equally good set of co-efficients might be found by trials; and the question then would be, which set, taking the experiments singly, as well as collectively, agreed best upon the whole. According to established mathematical principles, that by which the *sum of the squares* of the errors was least, would be entitled to the preference. And I may remark, that from the results exhibited by "Nautilus," it appears clearly that my formula would by that test have the superiority over his.

On the second part of "N.'s" letter, I have only to say, that I entirely approve of his mode of tabulating—a mode which is equally applicable to both our formulæ. My observation in the paper last quoted, ought to have been qualified thus—"Such table, *if not of double entry*, must consist of three parts," &c.

J. W. Woollgar.

Lewes, October 10, 1840.

HINT FOR THE IMPROVEMENT OF OMNIBUSES.

Sir,—It would be a great advantage to all, and especially to those at the far end of an omnibus, particularly if timid and shy, if a check string, running on two or three little wheels along the middle of the roof were fastened at one end to the far end of the omnibus; and at the other to a knocker by the guard's elbow; so that by a person's pressing the string downwards, the knocker would be raised. The moment the pressure was removed, the knocker would fall; thus apprising the guard that somebody wished to get out, instead of, as now, communicating this to those near the door—a tedious, and to many, an unpleasant thing.

I remain, &c.

E. M.

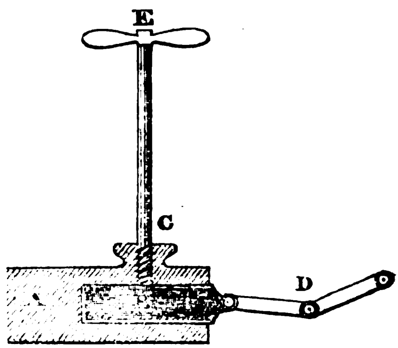
Monday.

[The sound of a knocker assimilates too nearly to those by which the omnibus is environed; a bell so placed, (a suggestion already noticed in our pages, and in one or more cases actually adopted) is decidedly preferable. Ed. M. M.]

RAILWAY CARRIAGE LINKER.

Sir,—I herewith send you a rough sketch of a linker or joiner for railway carriages, by means of which they may be so linked or joined together, as to be instantly detached in case of danger. It is especially adapted for the first or second carriage of a train; so that in case any accident should happen to the engine, the connection between the engine and train may be easily dissevered. It is not my object to stop the engine, or prevent its going off the line of railway; my object is only to prevent the carriages following it, whereby the passengers may be preserved uninjured.

I will therefore proceed to show the simple method that I think might be adopted to accomplish this without risk.



A is a box of metal forming part of, or attached to the frame of the carriage.

B, a quadrangular piece of iron just fitting into the box A, and securely held therein by the screw rod C.

D are the links for making the connection between the first carriage of the train and the engine.

Let us suppose a train going at its full speed, and all of a sudden the engine runs or is thrown off the railway; the conductor (if he is on the look out, as he always ought to be,) has nothing more to do than to turn the handle E of the screw C, once or twice round, which instantly detaches the engine from the carriages; the engine drawing the sliding piece of the linker or joiner out of its box, proceeds in its dangerous career, leaving the carriages to follow at a moderate speed, which may soon be entirely stopped by the application of the brake.

This same plan, I think, might be ad-

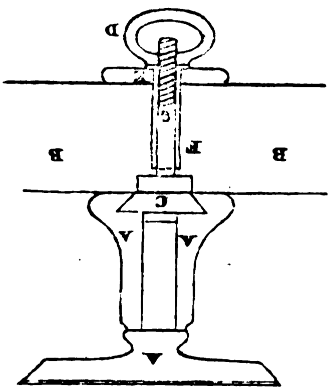
vantageously used on the London and Birmingham Railway (where a rope is now employed to draw the carriages up the inclined plane from Euston Square to the Camden Town Station.) The present is a most awkward make-shift way, dangerous to those employed, and altogether un-mechanical and un-workmanlike.

If you think the communication worth a place in your valuable pages, its insertion will not only oblige me, but I hope also serve the public.

I am, Sir,
Your obedient servant,
G. C.

Camden Town, August 19, 1840.

USEFUL APPENDAGE TO LATHES.



Sir,—I have forwarded you a sketch of a plan I have for some time adopted for preventing the chips and turnings which are continually falling through a lathe bed when at work, from getting into the lower set screws, either of rests or centre puppets, and with which the screws are continually clogged and (if the turnings are metal) injured; much force too being required to set the rest firmly down on the lathe bed, and if oil is applied, the evil being increased by the shavings adhering more readily. The remedy I have made use of is simple and effectual. Into the plate E (mine is circular) which slides under the bed, and through which the screw G passes, a piece of brass pipe is driven tight, and rivetted on the lower face a little countersunk, which pipe is sufficiently large to allow the screw G to be moved easily up or down, and of such a length as to be within an eighth of an inch of the shoulder of the dovetail slide C, when the rest is fixed firmly by the set screw. The shoulder of the dovetail slide C should be turned to fit the opening of the bed, so that there may be no possibility of twisting the pipe out of the perpendicular, when shifting the position of the rest either forwards or backwards. Oil may be then applied to the screw and shoulder, which will then work with the greatest ease and dispatch. The shavings in falling are prevented entering into the pipe by its proximity to the shoulder C. Should the shoulder, however be too narrow to prevent them altogether from getting into the pipe, the end of the pipe may be carried a short distance up the shoulder, which would entirely prevent any access of dirt, &c.

Should the above have any claims to novelty, by extending the application of the same, through your valuable Magazine, you will much oblige,

Your obedient servant,
AN AMATEUR.

Maidstone, September 24, 1840.

CUPOLA FOR REMELTING IRON.

Sir,—As I am on the point of erecting a cupola for *remelting* iron, and wish it constructed on the best and most economical plan, perhaps some of your correspondents would favour me, (and which would be of great use to other ironfounders,) with a sketch of one that would melt iron at the rate of six or seven tons per hour.

Though I am not aware of hot air having been fairly tried for the purpose of *remelting* iron, I should think it would answer well. I have a fan-blowing machine 4 feet diameter, and mean to make it revolve 2,400 times per minute.

I am, Sir, yours truly,
R. G.

October 5, 1840.

PRESEVARTION OF SHIP TIMBER.

Report of the Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic

Arts, to whom was referred for examination the propriety of the substitution of Lime for Salt, as a preservative for Ships: Report—

That they are called upon to regret that only a few facts could be brought to bear upon the question, and that the experience of others, as ascertained by an examination of approved works on the preservation of timber, is so limited, as not to permit of their giving a decided answer relative to the beneficial or the injurious effects of lime when used in the manner proposed. The effect of strong caustic alkali upon wood has been a subject of experiment, and resulted in the complete destruction or solution of the ligneous matter;* but it has been applied in a more diluted state with advantage, to remove and prevent the formation of fungus. The effects produced on vats in which caustic lye is made for domestic purposes, are to soften the texture of the wood in such a manner that the surface and even the interior to a short depth, may be peeled off in long and slender fibres when moist, or in shorter fibres when dry. There are no evidences of decay similar to that arising from rot, but it seems as if the substance cementing the fibres was removed by the alkali, while they are not influenced by it. This wood when dry is more flexible and less elastic, and its surface at least appears to be much lighter from the removal of a portion of matter. It has consequently a diminished hardness.

From the alkaline properties of lime we might infer a similarity in its action to potassa; an inference confirmed by observation. Wood covered or coated with lime in a moist or dry situation undergoes a similar change externally. There is no appearance of decay, but the fibres may be peeled off, the surface is lighter, softer, more flexible, and less elastic. These effects then are similar to those above noticed, excepting that they are exhibited in a diminished degree, for the action does not take place to the same depth, nor can the external fibres be removed with the same readiness. When in contact with alkaline substance, the wood does not appear to undergo farther change than that which has been described, but if the contact were broken there can be little doubt that it might be more readily injured by rot, from th softness of texture it has acquired, unless indeed it has become so impregnated as to obviate decomposing influences. The employment of lime, therefore, may be recommended as a preservative of timber, an opinion strengthened by the experience of ages.

But again, it becomes a question of importance to determine the state of the lime most favourable to its powers of preservation, for it is asserted that where wood remains a length of time in contact with quick lime and water, it suffers a more rapid decomposition than under ordinary circumstances. On the other hand, where wood is frequently washed with a coating of lime, suffering a short space of time to elapse between the several applications, the wood is not only perfectly preserved, but often becomes so hard as to blunt the teeth of a saw. In this case, it has become partially carbonated, including even that portion which has penetrated the wood. It would therefore appear to be more advisable, if lime should be substituted for salt in the case proposed, to employ it in a partially carbonated state, which may be attained by slacking quick-lime with a quantity of water, just sufficient to convert it into fine powder and then spreading it on any convenient surface for several weeks prior to its application, in order that it may absorb carbonic acid from the atmosphere.

But in the case referred to, there can be no doubt that a portion of the lime will be in contact with salt water. Can any injurious effect arise from this circumstance? The committee are of opinion that it cannot; for although a portion might be converted into muriate of lime under certain circumstances, the probability is that that portion would be small, and not capable of materially affecting the wood, even supposing it should do so injuriously, which the committee have no ground for believing.

Again, to an objection proposed, that lime might generate heat, it may be answered, that lime is known to combine with only one atom or 24 per cent. of water, forming the hydrate of lime (slacked lime) and that only during its combination does it evolve caloric; and since it is proposed to employ it in a slacked condition, this objection may be unhesitatingly set aside.

* Ure's Dictionary, art. Wood.

The presence of muriate of magnesia, in common salt, which is the material ordinarily employed for filling the spaces in the sides of a ship, by its strong affinity for water tends to keep the salt constantly in a moistened state and probably communicates no inconsiderable quantity of dampness to the vessel. It is highly probable that the lime would obviate this difficulty from its drying quality. The purifying effects of lime are also well known, and it is not an uncommon practice in the warmer climates of Europe to wash the interior of a ship to prevent and free it from contagion.

To compare the two substances together, it may be stated that salt hardens, while lime rather softens the external parts of wood where they are in contact with it, while both tend to prevent the rot, or the attack of insects; that the salt probably tends to keep the atmosphere of a vessel damp, which lime would not; that the lime will tend more to purify the air than the salt; that lime has a less specific gravity than salt, and is to be preferred on that account.

The committee, therefore, can perceive no ground of objection to the substitution of slacked lime for salt, for filling the interstices of the sides of a ship, particularly if employed in a partially carbonated state; while at the same time where so much interest is at stake in answering the question, the limited information on the subject which they possess will not allow them to give a decided opinion. In conclusion, they would request those who have observed facts, or acquired information, relative to effects of lime on wood under any circumstances, to communicate them to the Institute, in order that they may be brought before the public.

By order of the Committee,

WILLIAM HAMILTON, Actuary.

Philadelphia, June 11, 1840.

—*Journal of the Franklin Institute.*

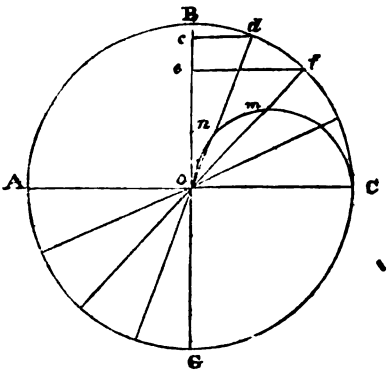
ON LONG AND SHORT-STROKE ENGINES AND THE LOSS OF POWER IN CRANK MOVEMENTS.

Sir,—In the article taken from Mr. Seaward's pamphlet to be seen in your last months' Magazine, page 198, there is a statement to the effect that no arrangement of long or short connecting rods in steam machinery or any crank movements can either increase or diminish the effective power of the piston rod, and there is a table annexed, in which the total leverage of the crank with two connecting rods of unequal length is shown to be equal. Now, this table contradicts the statement above made, for it gives the leverage when the crank is at right angles to the vertical line, and of course the connecting rod making an angle with that line at 1000, which could not possibly be the case unless that rod was of infinite length (and this is shown by the same table to be the case by the difference in the leverage given in the table in the three positions of the crank at angles of 90, 100, and 110 degrees,) as the effective power of the piston rod in the direct vertical line, is assumed to be only equal to that number. Or to take another view of the matter, as the table is calculated for the case where the connecting rod is below the crank, how does it happen that when the crank is at right angles to the connecting rod, the power is increased beyond the assumed quantity? How the power is increased under these circumstances, is a question much easier to ask than to be satisfactorily answered. The only reply that can be given is that the tables are calculated erroneously. Again, the leverage of both long and short connecting rods at 90 degrees, appears to be the same in both columns, notwithstanding the difference of the angles which the rods make with the crank, and the table shows a variation in the leverage, where less variation takes place in the angles.

There is also an error in the statement, and it is a very common one made on this subject, that the leverage of the crank represented by the sines of the angles, gives the power to turn the crank at that angle. Now, this is not correct—it only gives the number that carries the lever at that point to equilibrate. The whole matter in dispute between those who contend for a loss of power in the crank and their adversaries, depends on this point; it will therefore be necessary to go a little more into particulars.

Let the circle A B C G, represent the circle made by the crank, the lines C *d*, and *e f*, and *n m*, represent the sines of the angles at the points *d* and *f*.

Take C d in the compasses, and from o the centre of the circle towards d make



o n equal C d,—o m, equal e f, and through the points o, n, m, then draw the curve line o n m C. It can be proved that the curve which passes through these points is a semicircle, and therefore the length o n m C, bears the same proportion to the radius o C, as 1.5707 is to 1, but the quadrant B C, has also the same proportion to that line; therefore, these two lines B d, f C, and o n m C, are both equal in length, and therefore o n m C, is equal to the quadrant C B.

The obstacle opposed to the turning of the crank is represented by a weight suspended by a line passing round the axle; as the spaces therefore passed over by the extremities of the variable levers o, n, o, m, &c., represented by the line o n m, is equal to the spaces passed over in the same time by the other extremity of the lever at A, namely, A, B, we can represent the time by a line passing round both these curves; so that if we have a weight suspended from a line passing round the axle, we must have the power represented by a weight also suspended from a line passing round the semicircle o n m C, but this will make the power move through a space greater than what the piston rod of the engine moves (which is only from B, to C,) in the proportion which the circumference of a circle bears to its diameter; therefore, although the sines of the angles represent what will equilibrate the levers at each angle, yet the weight represented by the average leverage to be overcome, cannot move over a greater space than the diameter of the circle B, G; it will therefore be necessary to enable the same power to move it through the larger space, or what is the same thing, to turn the crank, that the weight which represents the average leverage as aforesaid, should be diminished accordingly, in the same proportion. The difference in the weights will be the loss sustained by making use of the crank, and this will be found to be about one-third of the power.

There has been a good deal of observation made in your publication to the effect that the doctrine here contended for interferes with the theory of vertical velocity; but I contend that the arguments here made use of, are by no means opposed to that doctrine, but on the contrary, are in support of it, which a very little attention to the subject would make manifest.

I am, Sir, your's, &c.

M.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Continued from page 394.)

Mr. William Ross, of the firm of Potter and Ross, resides at Pendleton, near Manchester. Is engaged in calico printing at Over Darwen, about 20 miles from Manchester. Has the honour of being vice-president of the Salford Mechanics' Institution. Has been in the trade about 19 years. Takes a very active part in superintending the printing department of the works; he generally goes down once a week to the works, and the business is so organised, that he has every morning a statistical account of what has been done at the works the previous day. Has considered the subject of the extension of the term of copyright of designs with deep attention. Thinks an extension of the term of three months' copyright is neither necessary nor desirable. With respect to the extension to six or twelve months on the home trade, thinks it is a question of degree; six months would be a less evil than 12 months; thinks an extension of time uncalled for, and dangerous as respects the home trade; as respects the foreign trade, it is his decided conviction that it would be extremely injurious. Considers the present term of three months' copyright a sufficient protection for the home as well as the foreign trade of the country. Is decidedly of opinion that the proposed extension would have the effect of

inducing the foreign calico printers to copy English patterns. Has had one of his own patterns copied abroad; the goods were confined to a German house. By confined he means engaged. He entered into an engagement with one house to sell it exclusively for that market, which was a German market. The goods went out, and afterwards the pattern was transmitted to Manchester; was engraved by the very person that witness had employed to engrave his pattern, and he has no doubt whatever with the very same machinery; the rollers were sent with great dispatch abroad, and the goods were produced with so much rapidity in the German market, that witness was undersold considerably. The party to whom he sent the goods supposed that he had violated his engagement. He informed them he had not done so. It turned out that his engraver had executed the pattern for the foreign house, and it was owing to his re-engraving the pattern and sending it out to that house, that witness's customer abroad was undersold considerably; should say 15 or 20 per cent—he said he was very considerably undersold. That was by a foreign calico printer, who had printed from that engraving in Germany an exact facsimile of the pattern, which was composed of two parts. It was a covered pattern, done by machinery, very cheap: what they term a blotch by a roller; there was a cover thrown over it, and both the cover and the blotch ground were copied; they were fac-similes, and they were, in my opinion, done by the very machinery that had produced my own. They sold the article referred to at their ordinary rate of profit. Is convinced that such occurrences would be much more frequent if the copyright was extended. Thinks that an extension of copyright would be the means of giving encouragement to foreign calico printers; thinks it would have decidedly that effect, because when it was known abroad that prints here were bolstered up in price (for an extension of the copyright would, in his opinion, be attended with an increase of price), and that no one could meddle with patterns till the expiration of twelve months, this state of things would operate as a bounty to our foreign rivals to copy us. Is of opinion that the object of obtaining an extension of copyright is to obtain an increase of profit and an increase of prices for the goods. Is of opinion that if an extension of the copyright were to take place, by means of which larger profits were obtained, the patterns being protected in this country would be sent to some foreign calico printer, to be by him copied and sent to neutral markets, in competition. It is his opinion that that would be the effect. Does not know what patterns would be sent; probably agents might be established in Manchester; knows that agents are established at present by our foreign rivals; at least hears so from undoubted authority. That is, agents from foreign markets employed to get patterns engraved here. Has never availed himself of the present protection afforded by law; has always found that energy and prudence in business were the best protection. Putting a moderate price upon his prints, he has been enabled to sell a larger quantity; and possibly he has made a larger profit than those who have protected themselves, and obtained a higher price. He might give a case in point: he brought out a style this Spring, and that style has been copied, but by activity he was enabled to bring 6,000 pieces into the market before the copier could get copies effected. Thinks that the most efficient protection against a copyist is to produce the article as cheap as it is possible, and to sell it at a moderate profit, and that protection he has considered the most efficient in conducting his business. Is not in the habit of copying the patterns of English calico printers—it is not at all his practice to copy. Thinks there are no houses it is less attributed to than to his. He gets ideas from French patterns, and he may copy portions of them; endeavours to combine new patterns from French ideas; sometimes he may copy them exactly, but not so frequently; his patterns are the result of combination. With respect to French patterns, knows it to be the regular practice of the Lancashire calico printers generally to obtain a supply regular; thinks they are sent to 20 houses at the same time, the very same patterns, and very likely sent by the same agent. A great many of them have an agent in Paris, and when patterns come out, they are regularly transmitted by post, and to all parties by the same post. The agent would be considered as acting unjustly if he did not transmit them to each house on the same day. We employ our own designer; has but one designer; the patterns are produced entirely by witness, the designer only executes the ideas which he gives him. There has been in witness's opinion a great waste of money in the production of patterns by many houses; some parties think the business cannot be properly conducted unless they have three or four designers—houses whose productions are not greater than his own; they give them ideas, and they say you must draw us something in this or that style; but unless properly conducted, it proves a failure. If the designing department be properly conducted, it may be brought within a very small cost. Cannot tell how many patterns he produces in his business annually, has never noticed the number; has always kept his eye upon the cost of producing the patterns; but he engraves the greater number of the patterns that he draws. Has actually calculated the

cost of designing: the average cost is about ⅘ths of a penny per piece. Witness is aware that it is the practice of some engravers to send patterns abroad to obtain orders to re-engrave them for the foreign markets. Has undoubted testimony that such is the practice—the testimony of Mr. Lockett; it was him that copied witness's pattern for the foreigner. To the best of witness's recollection his pattern was copied within the three months. It was the first order that had gone out; the pattern was promptly copied. Upon being informed that his pattern had been copied, he applied to know if Mr. Lockett had been instrumental in that copying. Mr. Lockett confessed that he had copied it for the foreigner, but did not think the copying would interfere with us. Witness told him that it had interfered very materially, and that his feelings were much hurt, because it might have led the party to suppose (though he was perfectly satisfied with his explanation) that he had broken his engagement, and that hurt witness more than the loss of money. Will not say it would be desirable to have no law of copyright at all; admits the principle of protection: it is to the degree that he objects. If there had been no law of copyright at all, all this might have happened. But if it were known to the foreigner that patterns in this country were protected for 12 months, having copied one successfully, he would copy another; but without the protection, they would be copied by a pirate, as he is called here in England, and he would send the goods out on a common cloth, and undersell the foreigner, and stop him from practising copying again. Does not think it extraordinary that in his nine years' experience his patterns have only been copied in one instance, because he brings his own goods out at so low a price as to prevent parties from copying. It is true the German copyist undersold him by 20 per cent: does not attribute that to the cost of the pattern; it was the difference of duty that enabled him to do so. Having copied the pattern, he was enabled to undersell the party who had paid a duty on the goods. If the term of copyright is extended, higher prices generally will be got for prints by those who avail themselves of the protection; and a further stimulus will be held out to foreigners to copy our productions. Is not prepared to say if he should avail himself of an extended protection; should see how it worked; if he could advantageously avail himself of it he should. Has always found that those who availed themselves of the law in its present shape have asked very exorbitant prices; they have sold fewer goods, but they have asked very high prices. The houses that protect their goods make larger profits in the aggregate upon their business than those houses which do not protect them. Is aware that 12 months' copyright exists in France, and it operates in that country—to the best of witness's knowledge, and according to the best testimony he has consulted—in this way; their taste seems to increase, but whether to attribute it to the law he cannot say; thinks that the French are naturally a people more inclined to taste than the English; but though more advanced in taste, they are by no means equal to us in economy in the cost of production; though the French have advanced so far in design, they have not advanced so much in the operative part; they cannot print styles by machinery that we print; and it is witness's firm conviction, after being 18 years in the trade, that we never should have been in the situation we are, as regards the print trade (for few trades have progressed so rapidly), had we had a 12 months' protection. The French have a machine called Perrotine, invented by M. Perrot, of Rouen, and intended to supplant our four-coloured machine, but there is no chance of its doing so; it is on sale in this country, but witness cares nothing for it; we can produce by our four-coloured machine styles at a much cheaper rate than can be produced by the Perrotine. Is of opinion that free competition in the trade has advanced printing to its present point. Although the French calico printers do not at the present time adopt our economical system of producing, thinks they will by degrees get more into our way; and, having a great superiority over us in designs, if they were to adopt the same economical means that we do they would then enter into a much closer competition with us. The French are progressing in economy of production, but they are protected for 12 months; and the consequence is that the English copy their patterns, and undersell them in neutral markets. At present they are superior to us in design, and we are decidedly superior to them in machinery. Thinks the 12 months' protection that now exists in France encourages to a great degree the copying of their patterns in this and other countries. If their copyright was limited to 3 months, like ours, much greater activity would take place in their trade, and there would be less copying of their patterns in this country; competition would compel greater activity. Thinks that if the law of copyright had been altered, as it is, now proposed to 12 months, 10 years ago, the trade would certainly not have been in as favourable a position as it now is. In that case the block printing would in all probability have continued the main branch of the business; it would have formed a much more important part than it does at present. Thinks block printing is likely to diminish, because machinery is advancing daily. Machinery

is a much cheaper mode of producing than by blocks. There are constantly new inventions making for the improvement of machinery; indeed it is surprising, when a person looks back 10 years and sees the rapid progress that has been made in this country in calico printing: we can print now what we could not print then, and we can produce styles at a greatly diminished cost to what we could then. Thinks it is wrong for himself or others to avail themselves of another person's ingenuity and skill; has a moral objection to copying patterns. It is unquestionably the duty of the law to protect other parties from the same immoral conduct; from his experience in the trade, it is his conviction that the application of the law in this case requires very delicate adjustment, and that the protection may be beneficial or otherwise, according to the degree. His objection to an extension of copyright is the impossibility of enforcing the law; that is his main objection, as it respects the home trade. Has had a great many of his patterns copied, but there is not so much copying now as formerly. If by "originality" something entirely new is meant, there is very little originality, and consequently very little copying; but if approximations to patterns be called copying—if taking styles be called copying—then he should say there is a great deal of imitation of styles. You have no chance of trade but by following the style, whatever i may be. Copyright does not profess to protect styles; it only professes to protect patterns. In the legitimate sense of the word "pattern," there is not much copying. There is much competition in originality, in the legitimate sense of the word "original." In the present state of the law the amount of that competition is a sufficient check upon any attempt at exorbitant profits. Thinks if we had an extended copyright there would be less originality—we should not have the number of new patterns that we now have, because parties knowing that they were protected would say, "I have no need to go to great expense; I have no need to bring out a repeated succession of new patterns; I am protected for 12 months; my patterns cannot be touched, and I will go on working them." Is convinced there would be no necessity for producing such a variety. Under a twelvemonths' copyright there would be a general disposition to work patterns for 12 months, without producing new ones to the extent they now do. There is a great demand for novelty, both in the home market and the foreign; and there is a rapid succession of new patterns, which is found to be advantageous. He had some idea of availing himself of the present copyright, and regrets he did not do so this spring. He is not inimical to the present copyright. It is a fact undoubtedly that the production of novelty on their part is in consequence of a demand for novelty on the part of the public. Thinks that the obtaining an extension of the copyright to 12 months can have no other object in view by those who are seeking it, than to enable them to work their patterns a longer time, and to obtain higher prices for their goods.

(*To be concluded in our next.*)

MR. HALL'S EXPERIMENTS IN CONDENSATION OF STEAM.

Sir,—My attention having been called to a controversy in the *Mechanics' Magazine* respecting the merits of Mr. Samuel Hall's patent condensers, in which Mr. Symington's and Mr. Howard's methods of condensation are alluded to, I am induced to give you some information which may be of use to your correspondents in their future discussions, and prevent their running (if you will excuse my saying so) into as great errors respecting the latter methods of condensation as they have fallen into regarding the former. Allow me, with this object in view, to say that there is one important matter that must not be overlooked, which must inevitably render Mr. Symington's, as well as Mr. Howard's, methods of condensation abortive, while Mr. Hall's method, as ample experience has shown, is quite perfect. The case is simply this: in a pair of engines of 200 horses power, Mr. Hall, by his method, has only about 13 gallons of water per minute (viz., that which results from the condensation of the steam) to cool, by means of metallic surfaces, to the degree required not to injure a vacuum; whereas Mr. Symington and Mr. Howard have, by their proposed plans, to cool nearly one hundred times as much, or about 1213 gallons per minute, supposing six gallons per horse-power per minute of injection water to be used. Now I presume that I need not tell you, that although the refrigeration of 13 gallons of water per minute can be perfectly and practically effected, it is quite another thing to have to deal in the same time with 1213 gallons per minute, although it is of a lower degree of temperature from which it has to be cooled than the 13 gallons above mentioned; and I have no hesitation in asserting, that the doing of that which Mr. Symington and Mr. Howard propose is totally impossible. We will, to illustrate the matter, take as an example the pipes as applied by the former gentleman to the outside of the *Londonderry* steam vessel, the quantity and size whereof were sufficient to hold as much injection water as would serve the engines for one minute only, reckoning six gallons per horse-power per minute;

wherefore it will be evident that the pipes will be emptied and filled once every minute. Now if the *whole* of the heat imparted to the injection water, by its admixture with the steam that works the engine, could be abstracted in one minute, then would Mr. Symington's plan effect the proposed object. But I assert, without fear of contradiction, that the whole of the heat (I mean in every degree) would not be withdrawn by the pipes in one, five, or even twenty minutes. If so, the injection water will become warmer and warmer every time it passes through the pipes; and supposing its temperature becomes elevated only two or three, or even one degree, per minute, it will soon become too hot to effect condensation, and in a very short time the engines will come to a state of rest. Now, Sir, I am not speaking in this way from theory, but from actual practice. I am the person who, in answer to some enquiries from the Lords Commissioners of the Admiralty, wrote the letter to Captain Gipps, of 6th May, 1835, respecting which Dr. Lardner was questioned by the Select Committee of the House of Commons on 7th July last. I have taken to a bleaching concern, which was formerly carried on by Mr. Hall; the engine respecting which I reported to the Admiralty is upon these bleaching premises, and it is ten horse power; it is the first to which Mr. Hall applied his patent condensers, but before he devised them, he most fully tried the application of pipes to cool injection water precisely in the same way as Mr. Symington applies them. In addition to the steam engine, I have a water-wheel which is worked by a stream of water that passes through a reservoir about 80 yards distant from the steam engine; in this reservoir Mr. Hall, in the year 1832, placed a number of pipes, of 7 inches diameter and 9 feet long each,* and there was a train of 4-inch and 3-inch pipes laid in the ground from the engine, to convey the injection water to the range of pipes in the reservoir; and there was another similar train of pipes to convey it back to the engine after it was cooled for reinjection. The water in these 7-inch, 4-inch, and 3-inch pipes was of course perfectly cold previous to starting the engine; at first it worked very well, but after being in operation a short time the mercury in the vacuum gauge became lower and lower, which was found to be owing to the injection water acquiring a small increase of temperature every time it was injected and passed through the pipes in the reservoir, till the engine, after working slower and slower for a certain length of time, stopped entirely. The engine was worked upon this principle for some time, but as it was found that no quantity of pipes at all within the bounds of practicability would answer the required purpose, they were taken away, and Mr. Hall devised his present condenser. I believe we had as much condensing surface in the pipes I have mentioned for the ten-horse engine in question as Mr. Symington put to each of the large engines of the *Londonderry* steamer, if not indeed even more. I have no hesitation in giving it as my opinion that the engines of that vessel never for one consecutive hour worked up to their full power upon Mr. Symington's plan, and without some injection water from the sea being admitted; and I challenge that gentleman to prove that I am wrong. Should your correspondents entertain the least doubt of the fact of Mr. Hall's having eight years ago fully done that which I have here stated, I will send you the vouchers of at least twenty other uninterested persons on the subject; and should they wish for any further information on the matter, I will with pleasure supply you with it.

I am, Sir,
Your most obedient Servant,
JOHN FOX.

Basford, near Nottingham, Sept. 21st, 1840.

* Previously to Mr. Hall's applying these pipes in the reservoir, he tried a *great number* of zigzag pipes placed in a vessel, through which a stream of cold water was passed, so as to come in contact with the outsides of the pipes, while the injection water to be cooled passed through their insides. The cooling surface of these pipes was very great, though not equal to that of the pipes placed in the reservoir.

THE "ECLIPSE" AND "FATHER THAMES."

Sir, — Your correspondents "T. D. S." and "Candidus" both concur in stating that the *Father Thames* has beaten the *Eclipse* "in a fair run to Gravesend;" but as neither of them has named the day on which the run took place, nor the time which it occupied, they must excuse me if I take the liberty to doubt their assertions. I have the less hesitation in doing this, as a friend of mine was on board the *Father Thames* last week when that boat was one hour and forty-eight minutes in steaming from Gravesend to Greenwich against the tide, the *Eclipse* having previously run the same distance in one hour and thirty-three minutes under precisely similar circumstances, as stated in my first communication. That the *Father Thames* is a fast boat, no person can dispute, but if she be as fast as the *Eclipse*, how happens it that the captain has orders *to stop* if the *Eclipse* comes alongside of him?

I gave it as my *impression* that the *Eclipse* was worked with steam at a pressure of 8 or 9 lbs. on the inch; but "from the *length* of the steel yard lever," "Candidus" would "put it down at considerably above 10lbs."

My mode of guessing may be, and no doubt is, "vague and unsatisfactory," as in fact I had acknowledged before "Candidus" made the *discovery;* but let me ask if it is more so than that which can determine the pressure of the steam "from the length of the steel yard lever," without any reference to the weight upon it, or to the area of the valve? Assuredly "Candidus" is a clever fellow!

I know no more of the pressure of the steam in *Father Thames* now, than I did when I last addressed you, and for the same reason; but *if* "it is under 5 lbs." it is contrary to the belief of all the river engineers whom I have conversed with on the subject, and they are not a few. But why cannot "Candidus" or "T. D. S." state the correct dimensions of the boat and engines at once, as I did those of the *Eclipse?* They assume *to know* them, and their refusal to communicate the knowledge they possess, or (as in their last letters) their palpable evasions can have but one effect—to produce a suspicion that there is *something to conceal.*

Since I last wrote, I *have* taken "another trip" in the *Father Thames,* and found the "*vibration*" almost as great as on my first excursion. Had it been as "slight" as "T. D. S." would have us believe, there could be no necessity for "placing two pieces of wood between" the levers used for lowering the funnel, and the funnel itself, seeing that they are at least two inches apart; but this is a "slight" admission which "T. D. S." may settle with the owners of the boat, who, I imagine, will scarcely thank him for it. In order to gratify "Candidus," I will favour him with another *impression,* which is founded on the observations of others as well as my own. It is, that the speed of the *Father Thames* is 14 miles per hour, and that of the *Eclipse* 15 miles per hour, in still water.

I am, Sir, your most obedient Servant,

A SUBSCRIBER.

P.S.—For what reason are *two* engineers required on board the *Father Thames?* It seems strange that a pair of "35"-horse engines cannot be worked with the same number of hands on that as on the other Gravesend boats.

Poplar, October 13th, 1840.

THE "ARCHIMEDES" AND "WILLIAM GUNSTON."

Sir,—If circumstances permitted, rest assured, after your remarks upon my letter to Captain Chappell, R.N., I would not trespass on your columns. The letter impugning my veracity, signed by the engineer of the *Gunston* tug-boat, renders that trespass necessary. In reply, my statement taken as it ought to have been in connection with the system of experiments acted on is correct. You are quite welcome to the full benefit of Mr. Blackburn's, who may not altogether be without ground for his, as there certainly was considerable manœuvring to get clear of vessels, and to get together in a position to *commence business;* and the *Archimedes* at that time might have pulled her consort in two or three cross directions, and possibly did, which that gentleman seems to have recollected better than

Your humble Servant,

CHRISTOPHER CLAXTON.

Great Western Steam Ship Office,
35, Princes-street, Bristol, Oct. 20th, 1840.

GLEANINGS FROM THE PROCEEDINGS OF THE GLASGOW MEETING OF THE BRITISH ASSOCIATION.

(Continued from page 397.)

(Chiefly from the *Athenæum* Reports.)

Blue Sun seen at Bermuda.—Sir David Brewster read a letter from Dr. A. W. Harvey, describing a singular appearance of the sun at Bermuda, which made some white objects appear blue. Sir David observed, that in the course of a series of experiments on the colour of mixed plates, both as produced by the soft solids compressed between plates of glass, and as exhibited in laminæ of sulphate of lime, and other minerals containing strata of minute cavities filled with fluids, he was led to the opinion that the blue colour of the sun was produced in a similar way by vapour or water in a vesicular state, interposed between the sun and the observer. Owing to this cause, the sun may exhibit any colour, and, in point of fact, he had once seen the sun of a bright salmon colour, in which both red and yellow were mixed with the blue. A similar effect is often produced when the sun is seen in a cold winter morning through the windows of a carriage covered with hoar frost, or when it is seen through vapour similarly deposited. Sir David referred to observations of his own published in the *Phil. Trans.* for 1837, in which he had shown that the colours of mixed plates were phenomena of diffraction produced by the edges of transparent bodies separating media of different density.

Chemical Manufactures of Glasgow and its neighbourhood.—(Dr. Thos. Thomson.) The *smelting of iron* has been practised in the neighbourhood of Glasgow for more than fifty years. At present the quantity of iron smelted in Glasgow and the neighbourhood cannot be much less than 200,000 tons, which approaches to a fifth part of the whole iron smelted in Great Britain. Fortunately for the smelters, the iron-stone and coal beds

are associated together, the iron-stone either occurring in boulders or beds along with the coal. The rapid increase of iron smelting has been the consequence of the discovery by Mr. Neilson of the hot blast as in Scotland. Till of late years, no bar iron was made in Scotland, the smelters confining themselves to cast iron. It is now conducted on a great scale by Mr. Wilson, at Dundyvon, and by Mr. Dixon, at Glasgow, and perhaps by other iron-masters. There is an interesting manufacotry of steel, at Holytown, not far from Airdrie, where melting and casting steel may be seen. It is curious, that the clay in the neighbourhood answers perfectly for making crucibles for cast steel; but it does not answer so well as Stourbridge clay, for making glasshouse pots. On analyzing the two clays, it was found that the Garnkirk contained much more alumina and less silica, than the Stourbridge; showing that glass in fusion acts more powerfully on alumina than on silica. (2.) Another manufacture of importance, and which is indebted to Glasgow for the state of perfection which it has reached, is that of *sulphuric acid*. It was begun by Dr. Roebuck, at Prestonpans, about the year 1763, but about twenty years ago that manufactory was abandoned. The sulphuric acid works, at St. Rollox, on the banks of the Monkland canal, were begun about forty-five years ago. They were at first upon a very small scale, though now probably the largest of the kind in Europe. When in full work, the quantity of sulphuric acid made exceeds 300,000 lbs. avoirdupois per week. Forty-five years ago, it cost 8d. per pound; the present price is under a penny per pound. (3.) One of the great purposes to which sulphuric acid is applied at St. Rollox is, the manufacture of *bleaching powder, or chloride of lime*, as it is now called. When the mode of bleaching by chlorine was introduced into Great Britain, by Mr. Watt, in 1787, the very offensive smell and deleterious effects of that gas upon the workmen, was a formidable objection to its use. Various methods were tried to remove this objection. It was found, that if potash or soda was dissolved in the water before it was impregnated with the chlorine gas, the disagreeable smell was destroyed; but, unfortunately, this addition destroyed at the same time the bleaching power of the gas. At last Messrs. Knox, Tennent, and Macintosh discovered, that if lime were mixed with the water before it was mixed with the gas, the disagreeable smell was obviated, while the bleaching power still remained uninjured. They took out a patent for this discovery; but it was infringed upon by the Lancashire bleachers, a lawsuit was the consequence, and the patent was destroyed. It was then that Mr. Macintosh tried, whether chlorine would not be absorbed by slacked lime. The trial succeeded: a compound was formed, which readily dissolved in water, and the solution of which possessed great bleaching power; a patent was taken out for the manufacture of this dry powder, which the patentees distinguished by the name of bleaching powder. This patent was not infringed; the sale of it was at first small, and it was overlooked by the bleachers. The consequence was, that the patentees had leisure to perfect their method of preparing it, and to become able to sell it at so low a price, that it gradually superseded all the old methods of bleaching by chlorine. The process may be seen at St. Rollox in great perfection, and on a very large scale.—(4.) Another chemical manufacture, which may be seen, is *alum-making*. There are two establishments, one at the Hurlet, about six miles south-west, by the Paisley canal; another at Campsie, about eight miles off, near Kirkintulloch, on the Great Canal, and near the foot of the Campsie Hills. The alum is made from the *shale*, which exists in great abundance in the exhausted coal beds. This shale is a clay mixed with some coal, and with that variety of iron pyrites, which undergoes decomposition, and is converted into sulphate of iron, by exposure to the air. The sulphate of iron, thus formed, acts slowly on the clay, and in process of time converts it into sulphate of alumina. The alum-maker washes this altered shale, and obtains a solution of sulphate of iron and sulphate of alumina. When sufficiently concentrated and cooled, the liquor yields an abundant crop of *sulphate of iron*, which is removed, dried, and sold at a cheap rate. The sulphate of alumina does not crystalize till it is mixed with sulphate of potash or sulphate of ammonia; because alum is a double salt, composed of three atoms of sulphate of alumina and one atom of sulphate of potash, or sulphate of ammonia. Formerly nothing but chloride of potassum, brought from the soap-makers, was used. But of late years (at least at Hurlet), sulphate of ammonia, from the liquor obtained during the preparation of gas, has been employed. In general, the alum made at Hurlet contains both potash and ammonia; but the manufacturer can supply it free from potash. Such alum is convenient to chemists, because when it is heated to redness everything is driven off except pure alumina. At Hurlet and at Campsie both, the mode of concentrating the liquid by a current of heated air passing over its surface, deserves attention. (5.) At Campsie alum works may be seen another interesting chemical manufacture, the fabrication of *prussiate of potash*, a beautiful well known yellow salt, which crystallizes in truncated octahedrons. It was here that the manufacture of this salt, on a great scale, first

began. Before that time, it was only prepared in laboratories for scientific purposes, and sold at a high price. Mr. Mackintosh introduced it to the calico-printers, who use it extensively, to produce very beautiful blues and greens. It is prepared by burning the hoofs and horns of cattle in iron pots, along with a quantity of potash. The hoofs and horns of a hundred head of cattle are consumed every day in the works. (6.) Connected with this manufactory of prussiate of potash is another *of Prussian blue.* It is made by mixing sulphate of iron, alum, and prussiate of potash, and precipitating the whole by an alkali. The precipitate is at first light blue. But it is washed with new portions of water every day, for several weeks. At every washing the colour deepens, and when it has acquired the requisite shade, the Prussian blue is allowed to subside, the water is drawn off, and the powder allowed to dry. The colour varies according to the proportion of alum employed, and it has the finest colour of all, with the coppery lustre which is so much admired, when no alumina whatever is mixed in it. Another beautiful chemical product may be seen at Shawfield, near Rutherglen, about two miles from Glasgow, in the manufactory of Mr. White, named *bichromate of potash*, a salt very much used by calico-printers, and forming the finest and most indelible yellows, oranges, and greens. Its introduction constituted quite an era in calico-printing. This salt was originally made by heating chromiron ore with saltpetre, dissolving out the chromate of potash, and adding the requisite quantity of nitric acid to deprive the chromic acid of half its potash. When this process began, the salt was sold at a guinea an ounce. But now it may be had for two shillings a pound. It has been found that common potash of commerce may be substituted for saltpetre; and the manufacturers now contrive to form the bichromate at once, without requiring the use of an acid, which would nearly double the expense. Nearly all the bichromate used by the calico-printers is made here and in Liverpool. (7.) In the same manufactory may be seen a beautiful product, *tartaric acid*, which is used by the calico-printers to a large amount, chiefly to disengage the chlorous acid from bleaching powder, and enable it to destroy the colour on particular parts of the cloth, either that these parts may remain white. or that some other colour may be superadded. Tartaric acid is obtained from cream of tartar, by throwing down the tartaric acid by means of lime, and afterwards decomposing the tartrate of lime by means of sulphuric acid, and crystallizing the tartaric. (8.) At the same manufactory may be seen a pretty and simple process, by which the carbonate of soda is converted into the *sesquicarbonate*. By simply exposing it dry and in powder, in an atmosphere of carbonic acid gas, it absorbs the requisite quantity to be converted into sesquicarbonate. And this sesquicarbonate is chiefly used by the makers of soda water. (9.) Another chemical manufacture of considerable importance, and peculiar to Glasgow, is *iodine*. A few years ago there were no fewer than ten manufactories, in each of which it was made to a considerable extent; but as iodine is only used in medicine, the sale is necessarily limited, and most of these works are now abandoned. The process followed by all the makers was the contrivance of Mr. Macintosh. Iodine is made from kelp, and it deserves attention, that those kinds of kelp that contain most potash contain, at the same time, the most iodine. The kelp is lixiviated, and all the salts that can be extracted from the solution by evaporation are separated. The mother water remaining is now mixed with an excess of sulphuric acid. A great quantity of sulphuretted hydrogen is evolved, the bad effects of which on the workmen are obviated by setting it on fire, and allowing it to burn as it is extracted from the liquid. To the liquid thus freed from sulphuretted hydrogen and from muriatic acid, a quantity of binoxide of manganese, equal in weight to the sulphuric acid employed, is added. The whole is put into a leaden still, and heated to a temperature which must not exceed 190° or 200° at most. The iodine passes into the receiver, which consists of a series of spherical glasses, having two mouths opposite to each other, and inserted the one into the other. (10.) It may seem superfluous to mention *soap*, because it is a manufacture universally known; but soap of a very superior quality is made in Glasgow. The number of soap works amounts to seven, and one of these, that at St. Rollox, is the third, if not the second, in point of extent, in Great Britain. (11.) *Bleaching of cotton cloth* is carried on here to a great extent. It consists of four processes: 1st, The goods are boiled with lime, at a temperature above the boiling point of water. 2nd, The cloth is steeped in a solution of bleaching powder. 3rd, It is boiled with caustic soda or potash. 4th, It is steeped in water acidulated with sulphuric acid.

A New Method of Photogenic Drawing. (Dr. Schäfhaeutl.)—Dr. S. first obtains a paper of very great sensibility by a comparatively short process. He spreads on Penny's improved patent metallic paper a concentrated solution of the nitrate of silver (140 grains to 2½ drachms of fused nitrate to 6 fluid drachms of distilled water), by merely drawing the paper over the surface of the solution contained in a large dish. In order to convert this nitrate of silver into a chlo-

ride, Dr. S. exposes it to the vapours of boiling muriatic acid. A coating of chloride of silver, shining with a peculiar silky lustre, is by this method generated on the surface of the paper, without penetrating into its mass; and in order to give to this coating of chloride the highest degree of sensibility, it is dried, and then drawn over the surface of the solution of the nitrate of silver again. After having been dried, the paper is ready for use; and no repetition of this treatment is able to improve its sensitiveness. Dr. S.'s process for fixing definitively the drawing is as follows:—He steeps the drawing from five to ten minutes in alcohol, and, after removing all superfluous moisture by means of blotting-paper, and drying it slightly before the fire, the paper thus prepared is finally drawn through diluted muriatic acid, mixed with a few drops of an acid nitrate of quicksilver. The addition of the nitrate of mercury requires great caution, and its proper action must be tried first on paper slips, upon which have been produced different tints and shadows by exposure to light; because, if added in too great a quantity, the lightest shades disappear entirely. The paper, after having been drawn through the above-mentioned solution, is washed well in water, and then dried in a degree approaching to about 158° Fahrenheit, or, in fact, till the white places of the paper assume a very slight tinge of yellow. The appearance of this tint indicates that the drawing is fixed permanently. In order to obtain a photogenic drawing in a direct or positive way (without reverses), the author uses his above-mentioned paper, allows it to darken in a bright sunlight, and macerates it for at least half an hour in a liquid, which is prepared by mixing *one part* of the already described acid solution of nitrate of mercury with from nine to ten parts of alcohol. A bright lemon-yellow precipitate, of basic hyponitrate of the protoxide of quicksilver falls, and the clear liquor is preserved for use. The macerated paper is removed from the alcoholic solution, and quickly drawn over the surface of diluted hydrochloric acid (1 part strong acid to 7 or 10 of water), then quickly washed in water, and slightly and carefully dried in a heat not exceeding 212° of Fahr. The paper is in this state ready for being bleached by the rays of the sun; and in order to fix the obtained drawing, nothing more is required than to steep the paper a few minutes in alcohol, which dissolves the free bichloride of mercury. The maceration must not be continued too long, as in that case the paper begins to darken again. Another method of producing positive photogenic drawings is by using metallic plates, and covering them with a layer of hydruret of carbon, prepared by dissolving pitch in alcohol, and collecting the residuum on a filter. This, when well washed, is spread as equally as possible over a heated metallic plate of copper. The plate is then carbonized in a closed box of cast iron, and, after cooling, passed betwixt two polished steel rollers, resembling a common copper-plate printing-press. The plate, after this process, is dipped into the above-mentioned solution of the nitrate of silver, and instantly exposed to the action of the camera obscura. The silver is, by the action of the rays of the sun, reduced into a perfect metallic state, and the lights expressed by the different density of the milk-white deadened silver, the shadows by the black carbonized plate. In a few seconds, the picture is finished; and the plate is so sensitive, that the reduction of the silver begins even by the light of a candle. For fixing the image, nothing else is required, except dipping the plate in alcohol mixed with a small quantity of the hyposulphite of soda, or of pure ammonia.

Experimental Inquiry into the Strength of Iron, with respect to its Application as a Substitute for Wood in Ship-building. (Mr. Fairbairn.)—The number of vessels which of late years have been made entirely of iron, and the probability of the greatly extended use of this metal in ship-building, renders it desirable to attain additional knowledge as to its power to resist these strains to which it is subjected, in its application to the purposes above stated. Mr. Fairbairn's experiments have convinced him, that in proportion as the public become better acquainted with the valuable properties of this material, and its fitness for almost any purpose of naval architecture, they will be convinced that it is safer, and, perhaps, more durable than timber, and that confidence in it will be completely established. To meet the requirements for this purpose, the following series of experiments have been undertaken, and in a great measure completed. Part only, however, could at present be laid before the Section.—1st. A series of experiments on the strength of plates of iron, as regards a direct tensile strain, both in the direction of the fibre and across it. 2nd. On the strength of the joints in plates riveted together, and on the best modes of riveting. 3rd. On the strength of the various forms of ribs or frames used in ship-building, whether wholly composed of iron, or of iron and wood. 4th. On the resistance of plates to compression and concussion, and on the power necessary to burst them. The experiments were superintended by Mr. Hodgkinson, to whom Mr. Fairbairn acknowledged himself indebted for many of the results.

On Strength of Iron Plates.—In these experiments, all the plates were of uniform thickness. Their ends had plates riveted to

them on both sides, with holes bored through them perpendicular to the plate, in order that they might be connected by both, with shackles to tear them asunder in the middle, which was made narrower than the rest for that purpose. The results were as follows: Mean breaking weights in tons per square inch, when drawn in the direction of the fibre:—

	Tons.	
Yorkshire plates	25.77	Mean 22.52 tons.
Do. do.	22.76	
Derbyshire do.	21.68	
Shropshire do.	22.83	
Staffordshire do.	19.56	

Mean breaking weights in tons per square inch, when drawn across the fibre:—

Yorkshire plates	27.49	Mean 23.04 tons.
Do. do.	26.04	
Derbyshire do.	18.65	
Shropshire do.	22.00	
Staffordshire do.	21.01	

The foregoing experiments show that there is little difference in the strength of iron plates, whether drawn in the direction of the fibre, or across it. Mr. Fairbairn then gave the results of a long series of experiments on the strength of riveted plates. The same description of plates was here used, as in the previous experiments; the plates were, however, made wider than the former, in order that they might contain (after the rivet-holes, were punched out) the same area of cross section as the previous ones. Mean breaking weights in pounds, from four plates of equal section, riveted by a single row of rivets:—

20127	Mean 18590 lb.
16107	
18982	
19147	

The mean breaking weights in pounds from four plates of equal sections to the last, but united with a double row of rivets:—

22699	Mean 22258 lb.
23371	
20059	
22902	

Whence the strength of single to double riveting is, as 18590 : 22258. But from a comparison of the results taken from the whole experiments, the strength derived from the double riveted joints was, to that of the single, as 25030 : 18591, or as 1000 to 742. Comparing the strength of plates alone with that of double and single riveted joints, Mr. Fairbairn gave their relative values as under:

For the strength of the plate	100
For that of double riveted joints ..	70
And for the single riveted joints ..	56

Hence, the strength of plates to that of the joints, as the respective numbers, 100, 70, and 56.

Mr. Fairbairn then gave a table containing the dimensions and distances of rivets for joining together different thicknesses of plates.

A discussion ensued as to the comparative strength and safety of iron boats. Mr. Fairbairn stated, that from the manner in which the sheathing is riveted, the whole vessel becomes one mass; and though he did not come forward as the advocate of iron against wood, he would state that he considered iron as one-third stronger than wood, weight for weight.—Mr. Grantham knew iron boats that had lasted twenty-eight years in fresh water.—Mr. Taylor built an iron boat for a canal in 1805, and it was now in good condition.—Mr. Mallet had found from his experiments on the action of sea water upon iron, that the duration of a half-inch plate in sea water would be about 100 years.

CITY FIRE-ESCAPES.

On Tuesday last the Police Committee of the Corporation sat at Guildhall, on which occasion the following Report upon the subject of fire-escapes was presented to the Committee from Mr. Daniel Whittle Harvey, the City Police Commissioner, and Mr. Braidwood, the Superintendent of the London Fire-brigade:—

"City Police Office, Oct. 13, 1849.

"Gentlemen,—In obedience to your resolution of the 22nd of September ult., 'That the City Police Commissioner and Mr. Braidwood be requested to consult together, and report their opinion as to the best plan for a fire-escape, and such as they would recommend for adoption in the City of London,' we have proceeded without delay to the consideration of this most important subject.

"Although we had the advantage of being present when the various models and plans were submitted to your Committee, and of hearing the interesting explanations of their proposed working, we considered it due to the ingenious contrivers, who came before you, to reconsider their respective plans and suggestions with minuter attention to details than was practicable at the first and rapid exhibition of them. The models and explanatory suggestions brought under the review of your Committee exceeded thirty in number, each of which embraced one or more of three distinct objects.

"1st. Machines intended for domestic use only, to be resorted to by inmates of houses in cases of fire.

"2nd. Machines to be externally applied, and made to combine the security of property with the protection of persons.

"3rd. Machines exclusively for the protection of life from fire, to be externally applied uner the responsible direction of the police.

"While we felt that our attention and inquiries ought to be mainly directed to the latter of these objects, we cannot withhold the suggestion that more than one of the

first-named plans might be introduced, at a trifling cost, into houses with great advantage, especially in neighbourhoods not immediately within the reach of more public appliances.

"When it is known that easy means of descent from the loftiest apartments of a house may be permanently obtained at a cost considerably under 60*s*., an obligation is imposed upon the heads of families, which to disregard would not only disarm complaint of its justice, but strengthen the impression that the public are too prone to rely upon external agency, and to throw aside the precautions of individual prudence.

"Having determined to confine our attention to the objects stated, we proceeded to the selection of those plans with a view to their minute inspection, which appeared to us to combine to the greatest extent the principal objects to be desiderated in a machine intended for the rescue of life from fire. These objects are simplicity and strength of structure, facility of working and of transfer from place to place, and the ready varying of elevation.

"Upon a review of the models submitted to your Committee in our presence, four of them in an especial manner attracted our attention, and it is due to the parties to state that they not only submitted their respective inventions without the slightest reserve to our individual examination, but to the keener criticism of each other.

"Each of the plans thus selected possesses exclusive merits; and, in the discharge of a duty so interesting to the public, we have not hesitated to embrace the great advantage which a combination of excellences, not exclusively the property of either, naturally affords, and which we consider will be found in the plan we shall presently venture to recommend for the adoption of the City of London.

"The great experience of one of us in cases of fires, and of others who have been attracted to them, justify the opinion, that unless the means of escape are at hand within a very few minutes after the discovery of a fire, all human efforts must prove unavailing; and, it is not less borne out by experience and observation, that when the means were promptly available, no person, with one melancholy and fatal exception, who has visibly sought aid, has failed to find saving help.

"We are the more anxious to impress upon the minds of the committee the paramount importance of instantaneous aid in cases of fire, because we feel that unless instantaneous recourse can be had to well-adapted machines, and experienced men to work them, all their efforts and wishes must fail. Equally supported by experience is the statement, that in the far greater number of instances, the fire-ladders now used by the London Brigade, have been found, when promptly at hand, fully adequate to the purposes of rendering assistance to persons in danger, and although other machines or contrivances may be brought to bear in wide streets and upon lofty houses, that in the narrow streets, courts, and alleys, which abound in the City of London, no other instrument can be effectually used.

"But at present the brigade ladder is only in partial use, under the direction of the Fire Brigade, and in co-operation with engines exclusively employed for the extinction of fire and the rescue of property.

"To render these ladders at all times available, they must be placed under the responsible superintendence of the police, at intervals not exceeding a quarter of a mile, and upon carriages which will hold the several parts or joints of the ladders compactly together, until they arrive at the spot required. (1)

"To carry the suggestion into effect of having a set of ladders at all times available within the prescribed space, we find that the number required for the City of London will not exceed twenty.

"But while the experience before reverted to leads us to the conclusion that with the appliances just described, no human life ought to be lost when the danger actually presents itself, we are not insensible to the intense feeling which pervades the public mind upon the subject brought under our consideration, and that it is the duty of all public authorities to make every reasonable effort at whatever cost, to assuage the fears of the public.

"With this impression strong in our minds, we feel that we should disappoint just expectation, as also the liberal and humane policy of the Corporation of London, were we to restrict our recommendation to the ladder already described. We therefore strongly recommend that a machine should always be at hand, whose firmer appearance, and rapid elongation, should afford assistance to the infirm, and dissipate the alarms of the timid. Each of the machines which have been finished and exhibited before us embrace some of the requisite qualifications, but not one combines the whole.

"The fire-escape of Mr. Davies (2) is by far the most simple, and the mode of descent superior to any other, where it can be applied, the metal basket in a great measure screening those in it from the smoke, or partial flames from the lower windows, but the entire machine is ponderous, and requires

(1) Described in *Mechanic's Magazine*, vol. xxvi. page 449; and vol. xxviii. page 71, Nos. 709, and 743.

(2) Described in *Mechanics' Magazine*, vol. xxxiii. page 113, No. 884.

greater aid to move it with celerity than can always be obtained at the instant, while its unchangeable length restricts its action to all but the widest streets.

"The machine of Mr. Wivell (3), which has been for some time before the public, is superior to that of Mr. Davies, in so far as it is capable of some reduction, as well as extension, and moves on a carriage of easier guidance, yet its fixed length of 35 feet, and the great strain it requires to elevate it, together with the impediment occasioned to its progress by an adverse wind acting upon the canvass, and its inapplicability to the narrow streets, which abound in the City, are decided difficulties to its adoption.

"The sliding ladders of Mr. Gregory (4), when placed upon the carriage of Mr. Wivell, form the machine which, upon the whole, we venture to recommend for adoption in the City of London. The utmost length of these ladders, when travelling, is 24 feet, at which height they may be instantly raised, and without being moved, can be quickly extended to 40 feet, and with a little contrivance may be carried considerably higher.

"This machine may be drawn along the streets quickly, and quickly elevated by two men, while the method of raising the additional length is simple, and unencumbered with cordage and other contrivances which complicate many of the fire-escapes submitted to our inspection.

"While we feel assured that in carrying out a plan which has for its object the first of social duties, the Corporation will not be startled by expense, yet it may be expected that we should submit to your Committee some estimate of the probable annual cost of maintaining the proposed establishment, as well as the preliminary outfit.

"To have a set of brigade ladders, on a fitting carriage, in which are to be stored the ropes, belts, canvass bag, and other conveniences to facilitate descent, at intervals sufficiently near to be in actual use within five minutes after the discovery of a fire, would require twenty complete sets, and would cause an outlay of from 300*l.* to 400*l.*

"We further propose that ten of Gregory's ladders, mounted as before described, and similarly equipped as the other ladders, be assigned to appropriate localities, and committed during the hours of the night to the charge of the police constables.

"The cost of these ladders, with the carriage and equipments, would be between 300*l.* and 400*l.*, to which must be added the constant charge of ten constables.

"That these machines may be used with promptitude and precision, we suggest that the officers and constables of the police force should be frequently exercised in their use, and the whole placed under the control of the chief office.

"In noticing the subject of cost, and the maintenance of the Life Preserving Establishment we are induced to recommend, it will not fail to occur to your Committee, that its adoption will save the parochial authorities, within the City, much expense, and relieve them of the gravest responsibility.

"We have the honour to be, Gentlemen,
"Yours, &c.
"D. W. Harvey,
"James Braidwood."

(3) Described in *Mechanics' Magazine*, vol. xxvii. page 162, No. 723.

(4) Described in *Mechanics' Magazine*, vol. xi. page 113, No. 295.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

Richard Beard, of Egremont Place, New Road, Gentleman, *for improvements in printing calicoes and other fabrics*, being a communication from a foreigner residing abroad.—Enrolment Office, Oct. 6th, 1840.

There is a multiplicity and complexity of parts involved in these improvements which makes it difficult to explain their minute details; their general character, however, may be gathered from the following epitome of a threefold claim.

1. A mode of constructing a printing cylinder with all the raised or printing surfaces moveable, so that all those parts that are to receive the same colour may be brought together for that purpose, and afterwards dispersed over the cylinder in their proper places to form the pattern.

The mode of accomplishing this object is by means of sliding bars, and other adjuncts, in connection with a guider or inclined plane, so placed as to allow the raised surfaces that are to be charged with one colour to range themselves round the cylinder, in such a position as to take up the colour from the endless felts or other suitable materials, and then, by the action of the guider, to resume their original positions around the printing cylinder.

2. A mode of constructing a printing cylinder, so that the printing parts may be made to approach to or recede from the centre of the cylinder.

In this case the pattern is formed upon the ends of sliding bars, each one being moveable and independent of its neighbour. They are confined to their respective places, but slide freely inwards and outwards by means of bosses attached to the cylinder. There are slits or openings in each of these bosses, which become guides to the bars, so that, when properly adjusted, on turning the cylinder, each bar will project as it arrives opposite its proper colour. After passing its

colour, an eccentric motion, placed near the centre of the cylinder, causes the charged bars to move inwards, and other bars to protrude.

3. A mode of producing surfaces of cast metal on printing cylinders.

The pattern required is punched out of a sheet of zinc, $\frac{1}{16}$th of an inch in thickness, which is placed in a suitable mould, and melted metal poured into it, so as to fill up the vacancies produced by the punches. The face is then polished off, and treated with an acid which attacks the zinc, while it leaves the pattern in the other metal standing, forming a surface suitable for printing purposes.

James Caldwell, Mill-Place, Commercial Road, Engineer, *for improvements in Cranes, Windlasses, and Capstans.*—Enrolment Office, October 15th, 1840.

The first improvement relates to cranes, whereby the weights raised and lowered are more advantageously distributed. From an upright central post, mounted in a suitable step, the jib branches off in the usual manner; on the opposite side, a platform carries an upright and a diagonal stay from the post, connected above by an inclined stay from the jib; this arrangement gives increased stability, from enabling the strain of weights raised and lowered to be carried behind the centre, and thus allowing the crane to be worked more easily and advantageously. The chain is not wound upon the barrel, but only passed two or three times round it, the slack being taken up by a falling weight at the end opposite the jib of the crane. The second improvement is a mode of causing a rope or chain to fleet or clear itself on the barrels of cranes, &c., as hereafter described. The third is an improved construction of crane for loading and unloading lighters, barges, and such like craft; this improvement is only applicable where goods, &c., are raised in boxes of an uniform size—the loading or unloading of coals, for instance. The boxes are placed in two or more rows of threes, before and behind the crane, which consists of a revolving jib, and a counterbalance connected together by a strong tie at their extreme ends, and also tied diagonally to the centre post. The jib is composed of two iron plates with projecting ridges on their inner surfaces, upon which a runner moves up or down by means of friction wheels; this runner carries a pulley, which the lifting chain runs upon. At three different points in the jib there are stops, corresponding with the situation of the three boxes before mentioned, so that the runner, with its pulley, may be placed over each one in succession, the runner being under the control of a brake. The chain being made fast to one of the boxes, passes over the runner pulley to another pulley on the end of the jib, then takes a few turns round the barrel, and passes on to the counter-weight. There are two ratchet wheels in opposite directions, to prevent the barrel from running back, one only being used at a time. The fourth improvement is in the apparatus for working windlasses; in the first place the three palls are coupled together so that by means of a lever they may be simultaneously raised, the motion of the windlass being controlled by a brake. Cranked levers move on strong axes in the post, in which handspikes are inserted; to these cranked levers are attached, by a pin joint, an instrument consisting of two iron plates bolted together, the further bolt being so formed as to take hold of a series of teeth placed round the barrel of the windlass. When these levers are raised they slide back over the teeth, but on depressing them they pull the windlass round. There is also a contrivance for disconnecting this "driving instrument," and attaching the brakes to the same levers. If the brakes do not present a sufficient resistance in bad weather, "weather pins or bits" are placed below the deck bearers, round which the rope is passed. Another mode of constructing windlasses with double barrels is also described, with a clutch for working them together, or separately; as also a mode of placing the palls below the barrel, in which case each one is furnished with a projection, so that on depressing a lever the whole are raised together. In the former case the windlass gradually contracts towards the centre, but in both instances is furnished with "fleeting plates" (the fifth improvement), consisting of inclined plates of metal placed at such angles as to cause the rope or cable to slip off towards the centre, and always to keep itself clear and avoid fleeting. In large windlasses, friction pullies may be employed, but in ordinary cases the plane metal surfaces will be found sufficient.

The sixth improvement consists in the application under various modifications of similar apparatus to capstans to prevent "surging." The claims made are—1. The mode of constructing cranes, as described. 2. The mode of fleeting or clearing of the rope or chain on the barrels of cranes, by applying inclined surfaces. 3. The mode of constructing cranes for loading and unloading barges, and such like craft. 4. The application of the lever and instrument for working windlasses. 5. The mode of applying inclined surfaces, which are called fleeting plates, to the barrels of windlasses. 6. The mode of applying the same to capstans.

Samuel Wilkes, Darleston, Ironfounder, *for improvements in the manufacture of vices.*—Enrolment Office, October 16th, 1840.

These improvements relate, in the first place, to the making the chaps or bodies and limbs of vices of malleable cast iron, subsequently submitted to an annealing process. The patterns being prepared in some suitable material (brass being preferred) are to be carefully moulded in sand, in the usual manner: the holes necessary for subsequently putting the parts together being produced by sand cores. Also a mode of casting the pins or male screws of vices hollow; the hollow should be about ⅛ths of an inch in diameter, and may be left open, or it may have a wrought iron plug driven into it, to strengthen it. The annealing is to be performed with the rich iron ores of Cumberland, the time being regulated by the size of the article; articles of half an inch in thickness requiring about four days. The articles should be placed vertically, and heated to a blood red for three-fourths of the time, afterwards to a full red or white heat. Secondly, a mode of steeling the chaps of vices. Two dove-tailed grooves are formed horizontally in the jaws, into which slide tempered steel plates, properly cut. This method is considered by the patentee as greatly superior to the present mode of welding the steel faces, and with some justice; when thus fitted up, the steel faces can at any time be exchanged, recut, &c., without taking down the vice. Thirdly, the construction of parallel vices. The fixed chap is furnished with a plate having two dove-tailed projections, which the moveable chap embraces; there are also side guides, which give great stability to the whole. A mode of constructing parallel bench vices is also shown. The moveable chap is hollow, the under surface being flat, and moving along a bar, formed with the fixed chap, and which, with the leg, is the means of fixing the vice to a bench. A male screw works through the fixed chap; a tube, having a slit on the under side from end to end, is fixed to two hollow projections of the bar by two screws; a nut, having a female screw formed therein, is cylindrical, and moves within the tube: the nut is affixed to the moveable chap. By thus using cylindrical surfaces for the parts to move on, greater facility is obtained in making the parts accurate, and superior action is the result.

The claims are: 1. The mode of making the chaps and bodies or limbs of vices, by casting them of malleable iron, and submitting them to the process of annealing; and also the casting of the pins or male screws of vices hollow.

2. The mode of applying steel faces or surfaces to the chaps of vices.

3. The mode of constructing the sliding chaps of vices by applying double guides; and also the mode of constructing vices by cylindrical tubes or surfaces for sliding chaps.

HEMMING'S IMPROVED GAS-METER.

In the ordinary gas-meter originally invented by Mr. Clegg, there are certain defects which have hitherto prevented its successful operation. These are, a variation in the quantity of water the meter ought to contain, the freezing of the water in severe weather, and the corrosion or destruction of the metals from the voltaic or chemical action that ensues, when different metals are exposed to a liquid containing alkaline or other impurities. If the meter do not contain the exact quantity of water necessary, it no longer measures the gas passing through it correctly, and either the consumer or the supplier is defrauded; if the water freeze, the gas will not pass to the burner until the troublesome process of thawing the liquid is adopted; and if the metals are corroded, the drum of the meter may probably refuse to revolve on its axis, or it may be rendered entirely useless.

Mr. Hemming has overcome all these defects, in a very simple but perfect manner. His patent meter is provided with a small cistern, containing water to supply any loss in the meter by evaporation, or from other causes. By an apparatus of beautiful simplicity, unencumbered with valves or cocks, the water from the cistern immediately enters the meter, if there be the smallest quantity less than there ought to be, and ceases to flow the instant the true water-line is attained, while to guard against any excess of liquid, a contrivance is employed, by which the slightest additional quantity is immediately discharged into a separate receptacle. The metals are protected from chemical or voltaic action, by pieces of zinc, which are soldered on to different parts of the meter. By well known chemical laws the zinc attracts to itself all those impurities which dissolve or corrode other metals less oxidable than itself. This protection of the vital parts of the meter by zinc, enables the patentee to employ, in lieu of water, a saline solution, which does not freeze until cooled below the lowest temperature it is subject to in Great Britain.

The improved meter has been put to the most severe tests by highly skilful engineers connected with several large gas establishments, and its asserted advantages have been all amply borne out. We are happy to learn that the proprietor of Mr. Hemming's Patent has had an immense demand for them already, and that there is a probability of the public being now supplied with a meter which will cause them no trouble in winter, which will secure them from overcharge, and by its durability will spare them the expense and annoyance of frequently repairing or renewing this useful and beautiful contrivance.—*Morning Advertiser*.

TEST FOR WHITENESS.

Sir,—Can any of your numerous correspondents inform me of the best test for *white?* It is commonly known that snow is—as all *whites* in comparison with it partake more or less of a blue or yellow tint—but snow cannot always be obtained.

I am, Sir, your obedient Servant and Reader,

V.

October 16th, 1840.

NOTES AND NOTICES.

Pushing on Railways.—The dangerous consequences of this practice, so ably commented upon in our last number, by our old correspondent Col. Maceroni, were strikingly exemplified a few days since. The *Paisley Advertiser* states that at four o'clock last Saturday morning, as an engine was coming westward on the joint railway, and pushing seven empty ballast waggons before it, at the moment when the first waggon was about to clear the west-end of the tunnel, it was suddenly forced off the rails, and all the other six waggons, with the tender, were thrown over and crushed together in a heap. Of 27 men that were in the waggons, 12 or 14 were hurt, 9 of them seriously. The engine itself was not thrown off the line. How many victims are to be sacrificed, before this highly reprehensible practice is strictly forbidden? How can any mechanical mind tolerate an absurdity so unmechanical, even leaving its imminent danger out of the question?

Escape from Fire.—On Tuesday night, about 11 o'clock, a fire broke out in the house of Mr. Kingsnorth, at Stone's End, in the Borough. The fire originated at the back of the premises, and before discovered, the ascending flames and smoke reached the stair-case, and cut off the egress of the inmates in that direction. Mr. and Mrs. Kingsnorth, on being alarmed, rushed to the first floor windows, when the police directed them to throw out a blanket; this being complied with, the police held the blanket for Mr. and Mrs. Kingsnorth to jump into, which they did in safety. The shopman appeared at the second floor window, from which he most unhesitatingly threw himself, and was also caught uninjured. The servant maid was still higher up, and soon appeared on the third floor; however, she fearlessly followed the example of her fellow servant. The great height from which she descended, caused the fabric of the blanket to give way, but it had so effectually broken her fall, that she got up and walked away unhurt. Mr. Baddeley was on the spot within five minutes after the discovery of the fire, with a set of Merryweather's fire-escape ladders, in good time to have rescued all the inmates, had they not already precipitated themselves in the manner stated. The ladders were promptly raised, and Mr. Baddeley having ascended and found that no person remained on the premises, proceeded to rescue some portion of their contents. Mr. Baddeley was followed in about five minutes by the fire-brigade from the Southwark-bridge Road, with their engines, and water being obtained, the fire was promptly extinguished. D.

Indian Isinglass.—A product of India, the suleah fish, which abounds in the rivers that intersect the Sunderbunds, as also in the estuaries of Bengal, has attracted the attention of a correspondent, who shows that it possesses a property from which isinglass is manufactured under a monopoly raised by the Chinese, and which has hitherto escaped the observation of European speculators. According to the description afforded, the suleah attains a large size, weighing in some cases 1 cwt. and upwards. It may be taken all the year round, and large quantities of it are brought up in boats to Calcutta, where it is cured, and thence conveyed as an article of merchandise into the inland provinces, where it is purchased for consumption, chiefly by the poorer classes. The discovery that this fish contained the property for the manufacture of isinglass was made in the following manner:—A purchaser gave his servant two that he had bought of a fisherman, and desired him to do the best he could with them. A subsequent examination of the bladders was accidentally made. They were found to resemble dull amber, and were exceedingly hard and pellucid, bearing a striking resemblance to the book isinglass of commerce. He had a portion of one of them cut off and boiled in some clear tank water, strained off and placed in a cool atmosphere, and on the following morning it turned out as firm and translucid an isinglass cake as he had ever witnessed. Satisfied that his discovery was a valuable one, he submitted the further working of it to an eminent chymist at Calcutta, who having cleansed it, by the help of a Chinese shoemaker cut it into fine threads, and then it appeared equal in every respect to the isinglass in the market. On further inquiry it was ascertained that the Chinese had a monopoly arising out of the suleah fishery; that, in fact, not one fish out of a thousand that came into the market ever contained its bladder, but that they were taken out by the fishermen as soon as the fish were caught, and handed over to the Chinese contractors. These bladders were shipped off to Macao, where they were dressed and prepared for the Chinese trade. It is supposed that to the Chinese this must be a considerable source of profit.—*Times.*

Improved Capstan.—A new schooner, called the *Breeze*, built by Messrs. Hedderwick and Rankin, in Glasgow, having come into our harbour to load sugar for the Mediterranean, has excited considerable interest by having a capstan on an entirely new principle. The common capstan is worked by bars radiating from the centre, about six feet long, and requires about 12 feet of clear circular space on deck to work it. This prevents its application in many cases where a clear space of this diameter cannot be got without sacrificing the room or accommodations of the vessel. It is to obviate this disadvantage, and at the same time to produce a more powerful machine, that the new capstan has been invented. Several shipmasters, and others connected with the shipping of this port, inspected it yesterday, and the general impression is, that it is a decided improvement, and possesses many advantages over the common ship capstan. It is the invention of Mr. Peter Hedderwick, who had the drawings and a model of it made some time back, although the one on board of the *Breeze* is the first that has been made on the large scale, merely by way of trying its power. Its advantages over the common capstan are—1st, that it occupies less room on deck; 2d, that it can be fitted up in places where it would be impossible to work the common capstan; 3d, that it is much more powerful, and does not fatigue the men as the running round with the common capstan does; 4th, that its power can be increased without requiring any more room on deck; 5th, that it can be converted into a ship's winch in half a minute; 6th, it can be shifted from one part of the vessel to another. On board the *Breeze*, it stands between the main hatch and main mast, (where, in this case, it would be impossible to work a common capstan) but as it is complete in itself, requiring no other fitting on standard to support it but merely the spindle, it can be shipped or unshipped at pleasure; and, any large vessel having one, it might be shipped on the main deck within three or four feet from the front of the poop, or shifted upon the deck, or top-gallant forecastle, as might be required.—*Greenock Advertiser.*

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 899.] SATURDAY, OCTOBER 31, 1840. [Price 3d.

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CROSSE AND BLACKWELL'S PATENT SOHO LAMP.

Fig. 1.

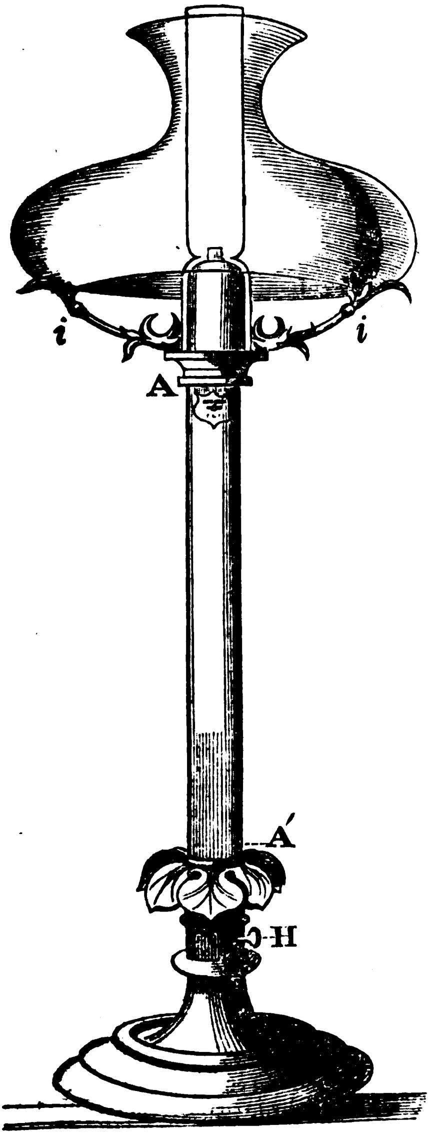
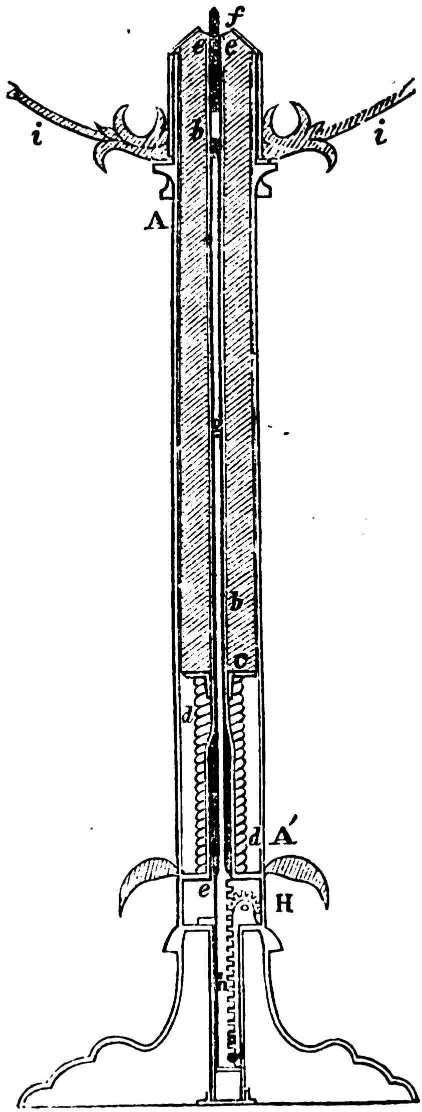


Fig. 2.



CROSSE AND BLACKWELL'S PATENT SOHO LAMP.

The expense of artificial light forms such an important item in the expenditure of every family, that it becomes in all cases one in which it is desirable to exercise the utmost possible economy, so as to obtain the greatest quantity of light, at the smallest possible cost. An active rivalry is now going on between different modes of illumination, chiefly in the adaptation of lamps to burn the cheaper class of oils; and this, notwithstanding the extensive and daily increasing employment of gas; what our position at this time would have been, if this invaluable source of light had remained undiscovered is a curious question, and one not easily solved. Certain it is, that even now, the demand for oil and candles of every description keeps pace with the supply, and supports prices which compel the most rigid economy in the use of these materials. These remarks have been suggested by the soft, yet full light which at this moment "cheers our mid-day gloom," emanating from one of Crosse and Blackwell's Patent Soho lamps; and as this lamp has several peculiarities, as also peculiar merits, we are desirous of introducing it to the acquaintance of our numerous readers, and with the aid of the accompanying drawings we hope to make its construction easily understood.

The Soho lamp is constructed on the novel principle of burning solid tallow, or any other substance of which candles are usually made, in the same manner as oil; that is — by the wick remaining stationary while the consuming substance is raised up to it. The arrangement by which this is accomplished is shown by the engravings on our front page. Fig. 1 being a perspective view, and fig. 2, a section of the Soho lamp. A A is the ornamental external casing of the lamp; *b b*, the candle, which is a hollow column of tallow, resting upon the pusher *c*, and always abutting against the cone-top of the lamp or burner, by the constant pressure of a spiral wire spring *d d*. A fixed tube *e e* passes through the centre of the candle, down the whole length of the pillar. The wick *f* is attached by a hook joint at *b'*, to a vertical rod *g*, sliding within the tube *e*, the lower part of which terminates in a rack *h*, acted upon by the pinion and nut H; so that on turning the nut the wick can be raised or lowered at pleasure. The cone-top which confines the candle, is held on by a bayonet joint in the usual manner; *i i*, is the gallery for the glasses.

When it is required to introduce a wick, the nut H is to be turned till the hook on the top of the rod *g* protrudes from the tube *e*; the short cotton wick being prepared by dipping in wax, and provided with a loop, is attached to the hook, and the pinion reversed until the rod is withdrawn sufficiently low to take the wick into the central tube, about ¾ of an inch being left projecting for lighting. On the wick being lighted, as the tallow melts, the spring *d d* will force up the column of tallow to supply the place of that consumed, till the whole is expended. If the light is not strong enough, by turning the nut H the wick is raised, and the light proportionally increased; if too strong, the reverse motion depresses the wick and diminishes the light. In this way the rate of combustion, and quantity of light obtained, is always as much under command as in the best oil lamps.

To extinguish the lamp, turn the nut H till the wick is drawn completely into the tube, and raise it again immediately while the tallow is warm.

The advantages of this lamp are, that it requires no snuffing or attention after it is once lighted; that the degree of light may be increased or diminished at pleasure; that when once regulated, it will always remain at the prescribed height; and its simplicity, its mode of action being understood on the most cursory inspection. It is cleaned and trimmed with as much facility as preparing a common candlestick for the table, and cannot be put out of repair but by actual violence. The manufacturers state that this lamp will give a light equal to four mould candles, at an expense of little more than a farthing an hour.

Our visual organs being in some degree of a delicate character, we are somewhat fastidious and hard to please in the matter of light, which must not be either too dim or too strong; and we find the soft and uniform effulgence of the Soho lamp especially grateful to our editorial optics.

CITY FIRE-ESCAPES.

Sir,—The report of Messrs. Braidwood and Harvey, inserted in your last Number, page 427, on the kind of fire-escapes best adapted for the protection of the citizens of London, has, I doubt not, been read with considerable interest, and I only regret that it is not such as to be altogether satisfactory.

It is now five months since your talented correspondent, Mr. Baddeley, called the attention of the city authorities to the defectiveness of their police force in cases of fire, especially with regard to the preservation of life; but it is probable, that gentleman's humane exertions to alleviate the fatal consequences of these deficiencies would have been unavailing, had not many serious, and two fatal fires, followed so closely upon each other, that it became impossible any longer to turn a deaf ear to the loud and pressing complaints which arose on all sides.

The subject was warmly taken up by Mr. Lott in the Court of Common Council, where, however, he had to contend not only with the apathy and lukewarmness of many, but with the scarcely concealed hostility of some of his colleagues.* At first it was proposed to transfer the investigation of this *delicate* and *difficult* question (!) to the notable wiseacres in the Adelphi; it was, however, ultimately handed over to the Police Committee, who, after holding several meetings, and going through the form of seeing the plans and hearing the explanations of upwards of thirty ingenious men, found the subject too deep for the deliberations of their collective wisdom, and turned it over to their Police Commissioner and Mr. Braidwood. After very great deliberation, on a subject which, from *practical men*, really required very little, these gentlemen have made their report to the Police Committee, who will in due course report thereon to the Court of Common Council, whence it will probably be referred back to the Police Committee, and by them to their Commissioner for adoption; so that from the time required for the business to progress through these several stages, it is probable another family or two may yet be burned to death before any provision to the contrary is completed.

With reference to the report, I have already intimated that it is not altogether free from objection; and I would crave permission to make a few brief observations on some points which seem to require elucidation.

After the great delay that has already occurred, it seems these gentlemen are still unable to do better than to adopt the plan originally suggested by Mr. Baddeley—viz., the portable fire ladders, which are stated in the report to be "fully adequate to the purposes of rendering assistance to persons in danger," and that "in the narrow streets, courts, and alleys, which abound in the city of London, *no other instrument can be effectually used!*" Twenty sets of these ladders, therefore, are recommended to be provided, which, so far as it goes, is all very well; but what will be thought of these practical men, when immediately afterwards we find them pandering to the vulgar prejudices of the ignorant, and admitting a necessity for adopting some large and showy apparatus, "whose *firmer appearance* should assuage the *fears* of the public, and dissipate the *alarms* of the timid!" Now as the provisions are to be made for cases of life or death, every measure proposed should be strictly *utilitarian;* the portable ladders either *are*, as stated in this very report, "fully adequate to the purpose," or they *are not*. If they are so, no other apparatus is required; if not, let one that is be adopted in preference. All that is wanted is, some sure and certain means of enabling the police to save life in all cases of fire, in all situations, and under all circumstances, where human efforts can prevail, without being misguided by the imaginary "fears of the public," or the groundless "alarms of the timid." Away with such mawkish sentimentality.

It is stated in the report, that "at present the *brigade ladder* is only in partial use, under the direction of the fire brigade, and in co-operation with engines exclusively employed for the extinction of fire and the rescue of property." Now this statement is notoriously false. If it is only meant to refer to the bare ladder, unequipped with the appendages, introduced (I believe*) by Mr. Baddeley, still it is untrue: seve-

* See page 118, No. 801.

* See Penny Cyclopædia, Art. Fire-escape.

ral sets of the *brigade ladders* being in use in St. Andrews,* and some other parishes both in and out of London; while the fire-escape ladders, in their highly complete and efficient state, as hitherto manufactured by Mr. Merryweather *only*, are extensively employed throughout the Metropolis,† as well as in many provincial towns, and on both Continents.

By the bye, I notice a somewhat remarkable suppression of the names of Mr. Baddeley and of Mr. Merryweather throughout the report in reference to these ladders; they are only spoken of as the "brigade ladders." Now the fact is, the brigade ladder was not exhibited to the Police Committee, and therefore was not one of the "four" plans which, "in an especial manner, attracted attention." Merryweather's ladders were exhibited, and their difference from the brigade ladders pointed out to the Committee by Mr. Baddeley (see page 320 of your 893rd Number); and that *this* is the contrivance meant, seems evident from the allusion subsequently made to "the rope, belt, and carriage," which have ever been the distinguishing peculiarities of Merryweather's ladders. If the total suppression of Mr. Merryweather's name (while those of other parties are given) is accidental, it is a great piece of carelessness; if intentional, then it is a gross injustice towards a highly respectable tradesman, and a very worthy man.

The report recommends the providing of 20 sets of the portable ladders, and 10 of those of "*firmer appearance*." From the data given, it will be seen that for the same sum, 40 sets of the former might be obtained, which would infinitely increase the actual protection afforded; though I deem 40 sets inadequate, to give satisfactory assurance of prompt and effectual assistance in all cases. I entirely deny the policy of adopting any "partially applicable" machines, if such as are *universally applicable* can be obtained; the inapplicable one may be brought first, and the time required to correct the mistake may be attended with fatal consequences.

The pecuniary part of the report is of a very slovenly and somewhat Irish character: after observing that "it may be *expected* that we should submit some estimate of the probable *annual cost* of maintaining the proposed establishment, as well as the *preliminary outfit*, what is submitted? The cost of the *preliminary outfit* within about 33 per cent.—rather a wide guess, considering that all the materials were at hand (or might have been readily obtained) for making an accurate calculation! The probable *annual cost* is omitted altogether; may we expect a postscript?

In conclusion, I am compelled to state that the present report is not so satisfactory as the names affixed to it would lead us to expect; it savours strongly of the old leaven of corporation jobbing, and bears evident marks upon its face of being intended to serve something more than the mere cause of neglected

HUMANITY.

Lombard-street, October 26th, 1840.

* With a set of which, *five lives* were very recently saved by the police.

† Two sets are stationed within two minutes' walk of where I am now writing.

MESSRS. BRAIDWOOD AND HARVEY'S REPORT ON CITY FIRE-ESCAPES.

"*Palmam qui meruit ferat.*"

Sir,—The report of Messrs. Harvey and Braidwood, on city fire-escapes, being now before the public, I take the liberty of making a few remarks thereon; and I flatter myself I may be pardoned —my acquaintance with these matters, both in theory and practice, being at least equal to that of any person.

With all due deference, therefore, to the opinions of these gentlemen, and with every respect for their abilities and good intentions, I trust I may be excused for differing from the conclusions to which they have arrived.

The total number of fire-escapes recommended by them is *thirty*,—ten of them being only partially available. The result of my investigations on this subject, induces a conviction, that less than SIXTY fire-escapes will not be sufficient to ensure the complete protection of the citizens, and even these must be universally applicable.

The *portable ladders* are, after all, to form the staple apparatus; but I consider the adoption of *carriages* for them highly injudicious; it is true, that in my communications in May last to the Po-

lice Commissioner, and to the Lord Mayor, I recommended the employment of carriages, and exhibited the ladders at Guildhall so mounted; but it should be borne in mind that this was for the purpose of combining *fire-extinguishing machinery* with the ladders, which is not now to be adopted. In one of the recommendations of the report "ropes, belt, and canvass bag," are to be "stored *in* the carriage;" which implies, I presume, that they are to be detached from the ladders, which will be an alteration—but assuredly no improvement. No one knows better than Mr. Braidwood, the confusion and annoyance sometimes occasioned by loose cordage, even in tolerably expert hands, and I cannot help thinking some error has crept into this part of the report.

In the popular contrivance of Mr. Merryweather, "the rope and belt," is conveniently affixed to the ladders—always at hand when required, but no incumbrance if not wanted to be used; it is instantaneously disengaged if needed, and I must be permitted to doubt the possibility of altering for the better, this very efficient and satisfactory arrangement.

The rope and belt being thus provided, the "canvass bag" is altogether superfluous; no "other contrivance to facilitate descent" being necessary. With this simple apparatus alone, I have brought down persons of all ages,

"From youth to hoary age,"

with perfect ease and safety.

The carriages for the ladders would, if adopted, cost nearly or quite as much as the ladders themselves, while it would be exceedingly difficult, if not wholly impossible to find suitable depositories for them at the places to which a regular distribution would assign them. By dispensing with carriages, and hanging a set of the ladders around the walls of each police station, depositing the intermediate ones in snug boxes, as is already done in the city, in St. Andrew's, St. Pancras, and elsewhere—great advantages would result.

An establishment of this kind, on the extensive scale I have ventured to suggest, would not exceed the *minimum* expense quoted in the report; the preliminary outfit, and annual cost of maintenance would be as follows:—

Sixty sets of Merryweather's portable fire-escape ladders, with guide wheels, safety belt, rope, and disengaging apparatus, complete, with (say) 40 boxes...... £600

The annual cost of maintaining these in a perfect and efficient state, would not exceed........ £20

With this outlay, it must be tolerably apparent that considerably more than three times the amount of protection would be ensured, than could possibly be afforded by the provisions advised in the report. No expense would be incurred for rent, nor would any extra constables be required to attend solely to the escapes, while the mode of using the foregoing, being simple, would soon be learned by the whole force. The escapes would also always "be at hand within a few minutes after the discovery of a fire;" being nearly one for every other beat throughout the city; their proximity would also be another very sufficient reason for abandoning the use of carriages.

I remain, Sir, yours respectfully,

Wm. Baddeley.

London, October 27, 1840.

LONG AND SHORT STROKE STEAM ENGINES, ANTHRACITE COAL, &c.

Sir,—In No. 890 of your Magazine is a communication from "P. R. H., of New York," on the comparative merits of long and short stroke steam engines, the intention of which is to show that long stroke engines possess considerable advantages over the short stroke ones so much used in this country; and certainly his statement of work done on board the *North America*, with a consumption of only 2.8 lb. of coal per hour per horse power, goes a great way in favour of the point he wishes to establish. But there is a circumstance incidentally mentioned that may, perhaps, materially affect the comparison of his results with the work done by short-stroke engines in this country, and which I think merits the serious attention of those concerned in our transatlantic steamers. The fuel of which so small a quantity sufficed for the work of the *North America* was anthracite—an exceedingly compact kind of coal, which burns without smoke, and almost without flame, being free from sulphur or bitumen, containing from 90

to 96 per cent. of carbon, and the remainder water and slight earthy impurities. There are, of course, varieties of quality; but the best, which is very abundant, is compact mineral charcoal, so perfectly clean that it will not even soil a white handkerchief any more than a jet bead will. With regard to stowage, it lies in smaller compass than any other known variety of coal, and is at least equal in effect, weight for weight, with the very best bituminous coal; at least, if it be not equal, the advantages of long-stroke engines must be much greater than even "P. R. H." calculates them to be. Now this kind of coal is abundant in South Wales as well as in North America, and there can be no doubt but that it is equal in quality, as shown by experiments made on board a small steam vessel on the Thames by Messrs. Parker and Manby, and detailed in No. 865 of your periodical, while the method which they made use of in supplying the fuel saves three-fourths of the labour of the stoker, and entirely relieves him from the distressing effects of exposure to violent heat, while very little ashes are produced, and scarcely any clinkers. Notwithstanding all this, I am credibly informed not only that the *Great Western* and other transatlantic steamers constantly use bituminous coal, but actually send out cargoes of it to New York, for their use on the return voyage. Surely there must be some cause for this more than a mere dislike of innovation, or disinclination to copy Brother Jonathan, who, I fear, will set us down for "*tarnation fools*" indeed (to borrow an expression from "P. R. H.") if we cannot show something like a reason for our perseverance in so expensive an arrangement.

Perhaps some of your correspondents may be able to throw a little more light upon the subject; for if the adoption of this kind of fuel (in sea-going steamers would be attended with anything like the advantages which I imagine must ensue, the saving to those which cross the Atlantic would be immense; and to those which only make short passages nearer home, would be such as to deserve the most serious consideration of their owners.

O. P. Q.

Winchester, October 24th, 1840.

THE ALLEGED ECONOMY OF AMERICAN STEAM ENGINES.

Sir,—We have been long accustomed to the American claim of superiority of speed in river steamers, but recently the claim brought forward in No. 890 of greater economy in the consumption of fuel deserves investigation—whether it is well founded, and if so, how far it may be considered decisive of the question of long and short stroke engines? Your correspondent, however, at New York, would confer a favour on some of your readers if he could add at his leisure the dimensions of the *North America*, her draught of water, area of midship section, &c.

The theoretical saving of fuel of engines of an equal power, worked by high steam expanded, and condensed when its pressure is reduced to one quarter of that of its admission into the cylinder, is about 50 per cent. in comparison with full pressure engines throughout the stroke, provided, of course, the boilers are constructed to admit of an equal water evaporation per lb. of fuel. It is obvious that the rule for horse power laid down in "Templeton's Engineers' Common-place Book" requires investigation, both as to its accuracy and also its coincidence with the rules used in England in expansion calculations. I conceive it is essential that the atmospheric pressure 14¾lbs., which is part of the actual load per square inch pressing on the safety valve, should be added to the boiler pressure of 50lbs., together making 64¾lbs. per square inch. The steam in the boiler resists the load on the safety valve, + atmosphere, and the pressure decreases inversely as the space from the total pressure.

Hence, admitting for an instant the impracticable condition of the equality of the boiler and cylinder pressure while the steam valve is open (since there is no evidence to determine the amount of difference), 64¾ × ,5966, the value of steam four times expanded in proportion to full stroke of the same steam, would give a mean pressure of 38,65lbs., from which the friction of the engine and the air pump, and imperfect vacuum resistances, must be deducted, to obtain the surplus pressure exerted on the shaft for calculations of horse power. The 29,82 lbs. mean pressure in the cylinder seems obtained by a similar

process in Templeton's rule, applied to the boiler pressure of 50lbs., and the addition of 5.75 appears to be the surplus pressure to condensation after the engine resistances have been provided for, making together a surplus cylinder pressure of 35.57 lbs. per square inch.

The result, I suspect, is an error in excess of not less than $\frac{1}{7}$th. I trust an appeal will soon be made to the Indicator in the United States, when I should not be surprised if the rule were found to be from $\frac{1}{5}$th to $\frac{1}{4}$th in excess.

The English rules, on the contrary, for the nominal horse power of low pressure engines, are usually allowed to be erroneous from $\frac{1}{4}$th to $\frac{1}{3}$rd, or even more, in defect.

In calling attention to the nature of Templeton's rule, for the calculation of horse power in American steamers, it should be observed that the merit of the boat is enhanced in proportion to the reduction of the horse power by which it is impelled.

A free and friendly exposition of facts on both sides of the Atlantic, I trust, will tend to a spirited rivalry in speed, and to more attention to the economy of fuel, and a correct system of estimating the horse power exerted by engines on the paddle shaft.

It would be a curious subject of inquiry in America how far the practical agrees with the theoretical saving of fuel to be expected in expansion engines, and how far the long stroke engine is advantageous for expansion. The question of the comparative merits of long or short strokes must be decided—not by the economy of coal, but by the economical application of the power derived from the evaporation of a given quantity of water.

I am, Sir, your obedient Servant,

S.

20th October, 1840.

IMPROVED PADDLE-WHEEL.

Fig. 1.

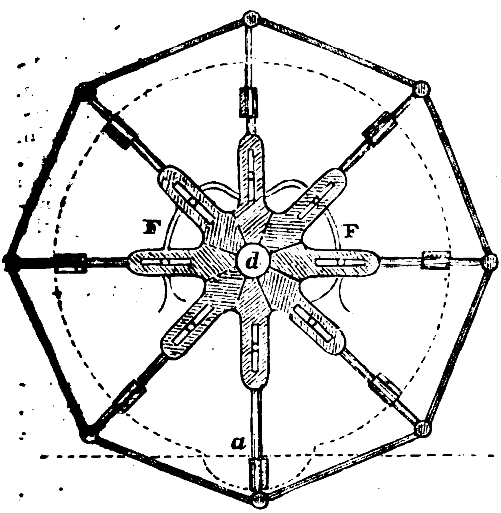
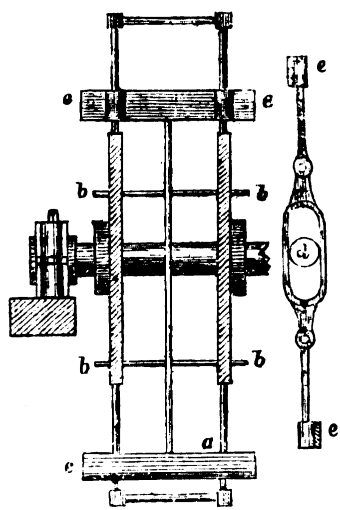


Fig 2.



Sir,—The steam boat propellers now in use I consider to be very imperfect, and I think every person who wishes well to steam navigation, should do his utmost to improve them. With that view I have taken the liberty to send you drawings of a paddle-wheel upon a principle which, I think will be both new and useful, if it can be adopted, of which I have but little doubt. If you, Sir, think there is sufficient merit to make them worth publishing in your Magazine, it will greatly oblige yours, &c.

THOS. WHITWORTH.

Royton, near Manchester, October 19, 1840.

Description of the Engravings.

Fig. 1 is a vertical view of the exterior framing of the paddle-wheel; fig. 2, a representation of the same partly in section, and seen endways; all the letters marked in the figures refer to similar parts. The one-half of the radial rods *a a*, next the circumference of the wheel are to be made round for the paddle boards to slide up and down upon them; the other half, next to the centre, are to be made flat, with slots for the reception of the guide rods *b b*, to slide within them, which are shown lengthways in fig. 2. These slots are to be double the breadth of the paddle boards. Fig. 3 is a longitudinal view of one of the rods to which the guide rods *b b*, are fixed at a given distance from the centre (four in number) which are seen edgeways in fig. 2. These rods have slots corresponding with those made in the radial arm of the exterior framing of the wheel, and slide up and down with the guide rods *b b*, while the crank shaft *d*, is revolving; at the ends of the rods are fixed the paddle boards *e e*. The guide rods *b b*, are seen extending through the slots made in the framing till their ends enter into what I term a concentrated groove F F, as shown in fig. 1, which may be made of wood, brass or iron. This groove must be fixed immoveably above the centre of the shaft to the side of the vessel.

A paddle-wheel upon this principle will not have the tendency to lift up the boat upon entering the water, nor will it make much back water in leaving it.

I have a drawing of a boat and propeller which I am of opinion will be better than either screw or paddle-wheel, and should be glad to show it confidentially to any respectable party through your medium, if they would be likely to bring it into use on approval.

Sir, I remain, yours, &c.,

T. W.

A QUESTION RESPECTING BLAST FURNACES.

Sir,—Many of your intelligent readers will smile at the following query: but two practical men are at variance on the subject, and will be obliged by a reply from one of your correspondents.

"If there are *two tuyere* pipes to a blast furnace of 4 inches diameter each, and the blast is compressed to a pillar of 3 lbs. on the inch, how many cubic feet of air are blown into the furnace in one minute?"

I am, your most obedient servant,

A CONSTANT READER.

October 26, 1840.

RAILWAY CARRIAGE LINKER.

Fig. 1.

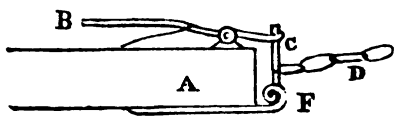
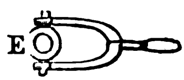


Fig. 2.



Sir,—Having seen the improved carriage linker described in your last number, I forward you the plan of one which I think superior in efficacy and simpliplicity.

Fig. 1, A is the carriage frame; B the lever, worked by the foot; C, the pin, by which the carriage is attached to the engine, having a joint at F. D, the chain, the end link of which has a swivel eye, shown at E, fig. 2, passing over the rim C. To release the train, all that is necessary is to press the lever B with the foot.

I am, Sir, yours, &c.

A BAKER.

Warwick-lane, Newgate-street.

REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS APPOINTED 7th FEB. 1840, TO ENQUIRE INTO THE EXPEDIENCY OF EXTENDING COPYRIGHT OF DESIGNS.

(Concluded from page 394.)

Mr. Joseph Lockett, of Manchester, is an engraver for calico printers; has been upwards of 20 years in that trade; his house is a very extensive one, it has been established upwards of 40 years. There is no other engraver in the same trade who carries on business to the same extent. He frequently employs above 100 persons, and pays nearly 200*l.* per week for wages. Both from his experience in point of time, and the extent of hiso wn business, he is perfectly cognizant

of every branch connected with engraving for calico printing. Is likewise acquainted with the state of trade on the Continent to a considerable extent. In every country where he has had business they invariably prefer the French designs, and they copy them extensively. In the last year he engraved above 300 patterns, not more than six of which were English, or could by any stretch of imagination be supposed to be of English invention. In the course of his visits to the Continent he has frequently heard them speak with the greatest contempt of English taste; and if he has shown them patterns, they have admired them for the execution, but quite ridiculed the idea of his getting orders for them. Has stated that in the year 1839 he produced upwards of 300 patterns, of which he thinks not more than six were English. In saying English, he had better explain himself: there are many patterns which he produces himself by peculiar modes of engraving, which are as much original as patterns can be drawn. They are his own invention; they are produced by machinery, and are such patterns as cannot be drawn; the machine that has to execute the pattern must of necessity invent it, because he could not follow an identical design. Cannot say that the pattern produced by this machine requires no previous design, or that it is accidental. If the machine was set to work it would continue producing the same pattern; but if witness makes a certain arrangement, which he does with a certain object, he produces a certain result; but he must previously conceive something. He can very often approximate very closely to what he conceives. If he puts a cylinder into the machine, and allows it to go on a little way, and just says to the workman, "You will remove this wheel, and put another in, and go on again," he has another pattern, corresponding with the idea in his mind. Sometimes he can scarcely foretel the result; in other cases he can approximate. The most successful designs he ever produced, as far as profit was concerned, have been by accident. The majority of patterns furnished to the Continental market, were produced by this machine, or were originals, or copies of the French. If a foreigner was to bring him an eccentric pattern, and ask him to produce the same pattern, he has such control over the machine he could at once set it to work with a certainty of producing a fac-simile; because he keeps an account of his patterns, and having a memorandum as to the arrangement of the wheels in the machine used in its production, he is in a condition at any time hereafter, by referring to those memoranda, to produce an exact fac-simile of the pattern. The machine is called an eccentric; it originated with his father, and has been perfected by himself; he has no patent for it. He is principally resorted to by foreigners for the eccentric groundworks. This eccentric groundwork, when applied to calico printing, is an elegant substitute for what is generally termed a blotch, and totally independent of the design that may be placed upon it; so much so, that the most favourite groundwork which Cobden and Co. of Manchester are using for their most elegant patterns has been used for the last six or seven years for the commonest prints that have been used, clearly showing that the groundwork is not of so much consequence. Does not think there is any more reason to apprehend the foreigner copying, provided the copyright be extended, than there is at the present moment from copying at home under the existing law. He considers that the competition at home is far more to be dreaded than anything abroad. He can give a reason why he thinks so: he thinks it has been previously explained, from what he understood as to what the process of engraving by a mill was, that you had to cut a die for the pattern before you could transfer it. Now there are frequently patterns of that sort; he could point to patterns which have been engraved by that process; they have been brought out by a house; they have been very successful patterns. When they entered into the hands of the party who copies, he would send for another engraver, not for witness if he had engraved them, because he would know that they would not do it; but a person whose purpose is copying must go on the most economical principle; it must be cheapness in this case that must give him his advantage; he sends for an engraver who will do it cheap, and this engraver will undertake the order for half the cost which it will take him to make the die. To cover which he goes to half-a-dozen other printers; he will send an impression of it to Glasgow; he will get an order for half-a-dozen rollers, from half-a-dozen different printers at the same price, say *5l.* each, he would receive for the whole *30l.*, which would answer his purpose very well, instead of which the originator had to pay four times that amount. Each of the parties who have got this roller commences printing with it, and they each bring their goods into the market at the same time. Immediately there is a race at underselling, who can get rid of their goods first. The consequence is that in many cases they sell at a loss, and injure the originator, making his original pattern almost valueless. These original patterns, which are copied, are probably three or four out of a dozen; the rest having been what are termed unsuccessful patterns. The good patterns are copied, the bad ones are left. In the case which he has in his eye while making this observation,

witness was paid 120*l.*; and the patterns which were left, and which were copied, were the only three or four out of the lot which succeeded, so that these three or four patterns would have cost between 30*l.* or 40*l.* each, and did, because they turned the other rollers off there ever having been a piece exposed or sold in the market. I cannot name the copyists, there have certainly been upwards of 20 persons who copied these patterns. They were of a class of patterns which were not very expensive, nor requiring much time to produce; their principal merit consisted in their simplicity and neatness. Considers they were decidedly original. Cannot say if they were copied before or after the three months; they have been copied by several houses, though they have been out for more than 12 months; in fact they are printing to this day, which proves the patterns were really good ones. These circumstances occurred two years ago, and the patterns are being worked now by those who copied them. Does not know if Messrs. Hoyle and Co., the originators, ceased to sell the patterns when they were copied. They complained bitterly of the extent of the injury done them. Mr. Beayon, the acting partner, came to witness the other day to consult with him upon producing some other patterns for the next season; but he said, "We are quite excluded from going into this simple style, they are so easily copied, and cost so little to the parties: can you give us anything that they cannot copy, for that seems to be our only protection." From his experience he considers the season lasts, generally speaking, more than three months; considers that a good pattern is valuable, or ought to be, for years. We have an instance in these very patterns that he has referred to—they are now engraving those very patterns for another house—but, according to the general understanding of the term, the season only lasts for a limited period, about three months. As an engraver, in the constant habit, and conversant with designs, he has never found any practical difficulty in deciding what was an original and what was a copy.

F. B. Long is officially employed as Registrar of Designs; that office has been in existence since July 1st, under the 2nd of Victoria, cap. 17. It embraces designs upon woven fabrics, but it does not embrace the designs of printers. Every class of design is protected, except those which are protected under the calico printing and lace. He finds there has been up to the present time 306 designs registered; there are 15 upon woven fabrics, besides carpeting and one ribbon. Believes the reason why parties have not availed themselves more extensively of this system of registration, is principally because they are not aware of the existence of the protection; but there are other reasons; there is the expense of registration, and also there is some inconvenience attending it. The expense is now three guineas on metal articles, and a guinea on others; it was originally three guineas on all, but was reduced in October last. The reduction was made in consequence of a memorial that was sent by the paper-stainers. Since the reduction there has been a very great increase in the number of registrations with respect to stained paper. There have been 152 designs registered on stained paper since the reduction. The fee of three guineas has been retained with respect to metal articles, because there is a greater extent of protection given to them. The number of designs registered on metal articles has been about 80, principally stoves. The number of paper-stainers registering, independent of the number of designs, has been seven, all London manufacturers. Attributes that circumstance for one thing to the facility afforded by their residence; another is, that they are better acquainted with it. Witness finds complaints existing against the excessive fees, from the manufacturers of figured silks. The fee in France for registering similar articles is, he believes, a franc for every year of protection. The 15 designs on woollen fabrics were only registered by two houses. Thinks the fee might be still further reduced, compatible with the maintenance of the office, and the efficiency of the registration. Has not formed any estimate in his own mind as to what minimum it might be reduced to; it is impossible to say, from the great variety of different articles for which designs are registered; from that circumstance it is difficult to say what they would come to at last. The amount of the fee rests with the Treasury. Conceives that leaving the power of fixing the amount of the fee as it is at present would contribute to an economical registration, so far as the interest of parties is concerned. The receipt of the fees does not at present pay the expenses of the office: the total receipts have been 556*l.* 2*s.* 6*d.*, and the total expenditure 424*l.* 11*s.* 6*d.*, but that does not include the rent of the office. Charges more for the registration of a design, the specification of which requires more writing, and extends over more pages than another; charges 5*s.* for each page. The process of registration is as follows:—First of all they require three drawings or copies of designs should be taken to them; two of these are placed in books, and the third is given back to the party, with a certificate pasted upon it of the design having been registered, and signed by witness; another certificate is also placed upon the design in the register. Previous to granting a certificate, never makes any enquiry as to the originality of the de-

sign; he always supposes the design is original when it is brought to him; for instance, in the case of a person which actually did occur, bringing me a design which consisted merely of the Queen's arms; of course I knew that was not original. Charges 5*s.* for searches; has frequently been applied to for that. Does not give the parties who ask to make searches a personal inspection; do that themselves. The only case in which they allow a party to see a design that is registered is when he brings one that is identical with it. The system of registration is now a close registry; it was not originally. Occasionally they had complaints against an open registry. Persons who came to register designs said they were unwilling that anybody should be allowed to come and pay 5*s.* and see all the designs that had been registered. They apprehended injury to their trade in consequence. Cannot say these complaints were very general; they were made in some instances. Has had one or two complaints since the registry has become close; one was from a patent agent; he considered it was a public office, and that anybody had a right to see the designs that were registered there; more particularly that he might guard himself against imitating any other person's design. Believes the practice at the Register-office in France is perfectly secret; the mode is this: the pattern is enclosed in a box, and that box is sealed, and is deposited in the Registry-office, and the box is only opened in case the copyright is disputed. That practice might readily be adopted in this country if secrecy were desirable, but witness thinks it would be attended with very great inconvenience. In case of litigation it would be inconvenient, because in that case it would be necessary to send the sealed pattern down by an officer belonging to the establishment. Thinks that two copies would be quite sufficient instead of three, but thinks the obligation of marking the articles would in some cases be productive of inconvenience, at least so he understands from the parties. There have been many complaints of the expense attendant upon the lodgment of three designs. It may be that some of the designs are of such a character, and cost so much, that it becomes a very serious source of expense to the designer; but he should think that merely a trace copy would be sufficient, which would not be so expensive. Should think that the registration would be equally efficient if the depositor of a design had the option of depositing either an actual specimen of the article, or a drawing upon paper, or in the case of woven fabrics a pattern or piece of cloth. At the present moment the law requires on each article deposited for registry, and on each article or piece published subsequently, the date and the number of the proprietor, which has been much complained of. In some cases the complaints have been of the inconvenience and impossibility of marking some of the articles, and in other cases of the date, which they say injures the sale of the article. Witness thinks that merely putting a number, with the word "registered" upon it, would be compatible with perfect security. Since the office has been opened, he believes one or two cases of copying have occurred; but they were not tried. He was in communication with the parties on the subject, but does not know how those cases were settled.

Mr. Cornelius Boyle, is in the firm of Williams, Coopers, Boyle, and Co., paper-stainers, West Smithfield; the present proprietors have been in partnership more than 30 years; their house is one of the most extensive in the trade. Thinks the highest amount of duty paid by them in one year is between 5,000*l.* and 6,000*l.* Nearly 200 hands are employed at their works; last year they produced nearly 200 pieces of paper-hangings, each 12 yards long and 21 inches wide. They never cease preparing designs; whenever they meet with a pattern that is approved they order it; it is then put into a state of progress till it is required. They show their patterns generally in the month of October or the beginning of November, to obtain orders for the employment of their workmen during the winter. They send out their travellers in October or November. Their delivery commences the first or second week in February, at which time the orders they have executed during the winter are delivered at the same time with the patterns; the orders are usually kept back till the delivery is ready. They begin to execute orders immediately they are sent home by our travellers, and they remain in their warehouse pretty generally until the patterns are ready in the spring, as there is no paper-hanging business going on during the winter months. It is not the custom among paper-stainers to employ designers on their own premises. The trade of designer for the paper-stainer is a distinct branch of this profession. The design is not estimated; they pay so much for the blocks, when they are in a fit state for use. What they term the pattern-drawer, or the designer, and the block-cutter, are one and the same person; the block cutting is not a distinct branch of business in this country, it is subordinate to the pattern drawer. They use three sizes of blocks, but all are 21 inches wide; the others vary in length from 10½ to 15¾, or 16 inches; others are 21 inches square. Witness cannot state the cost of the design separate from the blocks; the persons of whom they purchase the blocks will not set

a value on the designs; they will not sell them; they attach a value to the twofold operation, occupation of drawing and cutting, and will not separate the one from the other. Their general expense for blocks varies from 1,000*l.* to 1,500*l.* a-year. Having chosen the designs and purchased the blocks, they commence printing previous to sending their travellers out. Every pattern has to be struck off in five or six, and sometimes ten different sets of colours, in order to select those most suitable for the market. Should consider the impressions for their travellers do not cost less than 300*l.* or 400*l.* each journey, that is, twice a-year. The blocks of the pattern now exhibited cost 100 guineas, and the impressions for patterns alone cost 200 guineas. Should say in all cases the patterns cost as much as the blocks, but in most cases more. Spring and summer are the principal seasons for the sale of their goods; the general sale commences in March and closes in October. The duration of the sale of a pattern varies much; they have patterns now selling that are 20 years old, and they have others that are quite new that are not selling at all. Should take the average of a moderately successful pattern at from three to five years. At present they have a protection in these designs for 12 months, coupled with a system of registration, but in its present form they have no intention of ever registering another pattern; their objection to it is the extreme trouble of working it out, and the objection made by a great majority of their connexions to their name being emblazoned on the pattern. They have in many instances had their patterns returned to them not exhibited, in consequence of their name being so stamped upon them. Thinks if an alteration was made in the system of registration, and instead of the name a cypher was substituted, that objection would be removed. They cut up 9,000 pieces of paper annually, which cut into 180,000 patterns; on each of these, which are given away, there must be that impression. They make 200,000 pieces annually; on each of those pieces must be an impression also; so that the trouble and expense is greater than the benefit they derive from such limited protection. The date of the registration of the pattern proves the age of it, and their customers will not show a pattern that is not a new one. Object to their pattern in the registry being made public; should prefer a secret registration. The fee on registration is one guinea; thinks it greatly too much. Witness's objections to the present system of registration are, 1st, the impression of the name of his firm on the paper; 2ndly, the impression of the date of its production; 3rdly, its being an open register; and, 4thly, the excess of the fee. Before the passing of Mr. Poulet Thomson's Act, their property in their pattern was very seriously injured by copying; has no knowledge of any of their registered patterns having been copied. In copying one of their patterns, the copyist getting rid altogether of the charge of design, and employing inferior block-cutters, could produce the pattern at one half the original cost. The copyist has all the advantages of their skill and taste in the selection of colouring and adapting the patterns to the prevailing fashion; he is at no expense in sending out patterns, but executes orders from witness's specimens. He likewise uses inferior paper, colours, and workmanship. The papers may vary 20, 30, or 40 per cent.; in the colours there may be a variation of 200 or 300 per cent. In some cases witness has known the copyist to undersell him 50 per cent. Does not apprehend any ill effects from foreign competition in the event of the extension of copyright. It is difficult to say how many persons are employed altogether in England in the production of paper-hangings; but there must be several thousands, perhaps 3,000 or 4,000 altogether, connected with it. If an adequate term of copyright was given, they should be very ambitious to employ a higher class of artists; should consider it must have that tendency. The extension of copyright, by giving protection for such a length of time, would remunerate them for the great cost of their outlay; not less than three years would be sufficient to produce that effect. It would be reasonable, even for a cheap simple pattern, that there should be an extension of three years' copyright; their patterns do not come into operation with the public until the second year, and very many of them not until the third year. It is not as with garments or dresses, that merely pass off with the season. Their article is an article of furniture; and papering is not done in this country, but when painting and other repairs are going on in the house. It frequently happens that a pattern which is at first unsaleable subsequently becomes a favourite with the public after a lapse of time; the term of copyright having expired before the public have stamped it with favour, there is no prohibition to the copier—no protection for the proprietor. The pattern produced was brought out in 1831, but did not sell; it sold in 1832, and sold twice as much in the year 1833 as in the two previous years. The sale has continued up to the present time, and it has been copied by at least 20 houses. It was not copied until the second or third year; it was an entirely new style, and therefore it was not known whether the public would patronize it. Any protection for less than three years would be an outlay without any advantage; and they, as a house of extensive business, should not avail themselves of it.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

EDWARD THOMAS BAINBRIDGE, PARK PLACE, ST. JAMES'S, GENTLEMAN, *for improvements in obtaining power.*—Enrolment Office, October 12, 1840.

An open topped cylinder is placed vertically and fitted with a piston and piston rod, strong and heavy enough to overcome the friction of the piston in the cylinder; an inverted cylinder is placed on the top of the piston-rod, and below it a fixed piston, through which the beforenamed piston-rod works as in a guide. A series of teeth are sunk in the surface of the piston-rod, to which a wheel is adapted, having corresponding projecting teeth on a portion of its circumference, the other part being plain. This wheel being caused to revolve, by some applied force, the teeth take into the rack of the piston-rod and elevate it, causing a vacuum to be formed beneath the piston; but by the time the piston is at the top of the cylinder, the teeth of the wheel become disengaged, and the plain periphery presented to the piston-rod; the consequence is, the atmospheric pressure as well as the gravity of the parts, dashes the piston violently down to the bottom of the cylinder. In order to counteract the injurious tendency of this motion, the upper cylinder attached to the piston-rod, comes down upon the stationary piston, and enclosing a certain quantity of air, its compression modifies the violence of the shock, and by its elasticity assists in the subsequent elevation of the piston, &c. A fly-wheel is introduced to diminish the irregularity of the motion thus generated, which is to be communicated to machinery in the usual manner. This inventor and improver, claims, first:—the method of obtaining power by taking advantage of the force of accelerated motion caused by gravitation, in connection with a rush of atmospheric air into a vacuum. Secondly, the use of an elastic body to aid the return of a piston, upon which the rush of atmospheric air has exerted its power when rushing into a vacuum. This *shocking* contrivance belongs to the era of the perpetual motion seekers, and it is mortifying to us, after the pains that we and many cotemporaries are continually taking to disseminate better notions, to see such absurdities seriously entertained. After a sufficient quantity of extraneous power has been applied to drive this rude and cumbrous arrangement of mechanism, how much *power* will be *obtained?* Most assuredly, by these *improvements*, the *gain* will be a *loss!*

WILLIAM UNSWORTH, OF DERBY, SILK LACE MANUFACTURER, *for an improved tag for laces*, Enrolment Office, October 14, 1840.

This improvement is of a very paradoxical character, inasmuch as it relates to the formation of tags for laces in such a way, that the tag is "prevented from coming off the lace," and yet the wearer is said to be able "to supply a new tag at pleasure!" The mode of performing this improvement, is by striking the tag, either before or after* it is on the lace, with a pointed punch, (triangular being recommended) so as to form a burr on the inside, which holds the tag upon the lace. The oldest of our readers will recognise this process as one that has been already employed for securing tags to laces, ferules to sticks and umbrellas, &c., for the term of their natural lives; and we think it not very fair that a monopoly of this convenient process should be *attempted* to be set up at this particular time.

SAMUEL MARLOW BANKS, OF BILSTON, STAFFORDSHIRE, GENTLEMAN, *for improvements in the manufacture of iron.* Enrolment Office, October 14, 1840.

This improvement consists in the introduction of powdered slack, coal, coke, charcoal, limestone iron ore, &c. into the furnace with the blast. For this purpose, over a flange on the blast-pipe, a hopper is placed, the communication being regulated by a stop-cock fitted to the flange. The requisite materials being broken into small pieces, are put into the hopper through a screwed lid provided for that purpose. A small tube from the blast pipe communicates with the upper part of the hopper, so as to allow the contents of the hopper to fall by their unimpeded gravity when the stop-cock is opened. On turning the cock, the coal, &c. falls from the hopper into the blast-pipe, and is carried into the furnace. When the hopper has been emptied, the cock is turned off, the lid unscrewed and a fresh charge supplied, and the operation repeated. The patentee does not confine himself to this particular form of apparatus, but claims—"the mode of conveying solid particles into the furnace with the blast, be it either hot or cold."

WILLIAM POTTS, OF BIRMINGHAM, BRASS FOUNDER, *for certain apparatus for suspending pictures and curtains.*—Enrolment Office, October 15, 1840.

Consisting in a mode of constructing apparatus whereby pictures, curtains, &c. may be suspended with great facility, and pictures varied in position from time to time at pleasure. Two tubes hang perpendicularly from a cornice hereafter described; throughout the length of these tubes, at regular distances there are a series of holes, so formed as to allow a stud or button to be placed through the large opening and sink into the lower narrow one, whence it cannot be removed until it is raised. Two studs or buttons, having

* We *should recommend* after. ED. M. M.

hooks on their faces, are placed in two lower holes of the vertical tubes, upon which the picture hangs, by rings fastened to the lower part of the frame. To the back of the upper part of the picture frame, a piece of tube, similar to the vertical one, is affixed, but the holes run right and left from the centre with rings at each end. Two studs carrying small pullies are placed in the vertical tubes on a level with the picture; a small cord passes through both these pullies, and each end being brought through the rings before mentioned are attached to two studs, which, being placed in appropriate holes in the horizontal tube at the back of the picture, support it at any required angle from the wall. In this arrangement, it will be requisite to employ a step ladder, to get at the top button to alter the angular position of the picture: to obviate this, it is proposed to use a longer cord passing through four pullies down to a small windlass, and attached by a stud to the vertical tube near the bottom of the picture. By winding or unwinding this cord the picture is placed at a greater or less angle from the wall with ease. The graduated rods or tubes, may be in the form of a descending ornamental chain (several beautiful drawings of which accompany the specification,) all that is necessary, being to preserve an uniform horizontal position of the corresponding openings; the mode of suspending them is by the upper part being hook shaped, and sliding on an iron rail placed round the room, concealed by a handsome brass moulding. When heavy weights are to be carried, whether of pictures or curtains, two flat surfaces or rails are formed upon which an elongated carriage runs freely by means of two antifriction pullies; a stem descending between the rails and terminating in an ornament, carries the curtains. For small pictures, connecting rods may be attached to the vertical suspenders, and the picture attached to them. These improvements are intended to be applied to all kinds of house or bed curtains, and to supersede the use of the ordinary rods and rings. The claim is—1. The mode of constructing apparatus for suspending picture frames, as shown in 11 figures accompanying the specification. 2. The mode of constructing apparatus for the suspension of curtains.

William Crane Wilkins, of Long Acre, and Matthew Samuel Kendrick, of the same Place, Lamp Manufacturers, *for certain improvements in lighting, and in lamps.* Enrolment Office, October 28, 1840.

The first of these improvements relates to the construction and use of Argand lamps; from the oil cup at the base of the burner, an inner tube rises, having on its exterior surface a spiral groove or worm: the outer case, or tube, has a groove cut vertically on its inner surface; the cotton holder has a projecting peg at each end, one of which takes into the spiral groove, and the other into the vertical, whereby the holder is made to move upwards or downwards when motion is communicated to the inner tube by turning round the oil cup. In this way, the cotton wick and flame of the lamp may be adjusted from time to time, without removing the glass or glasses, while, by having no separate inner revolving case or racks and pinion, diminution of bulk in the burner, as well as increased stability are obtained. Seven different forms of glass chimnies are set forth, in which the diameter of the chimney is contracted in such a manner, as to incline the ascending column of air towards the flame of the lamp, whereby more perfect combustion and increased light is obtained. (This appears a very excellent sort of lamp, and in a subsequent number we shall give a drawing and more particular description of it.) The second improvement, relates to a new method of feeding or supplying oil to the reservoirs of Argand lamps; these lamps as usually constructed, unscrew at the base of the cistern, which has to be disconnected and inverted every time a fresh supply of oil is required. This is proposed to be obviated, in pillar lamps, by using two reservoirs for oil in connection with an air chamber placed below; the upper reservoir is furnished with a valve, which, when opened, allows the oil to descend into the air chamber; the air thus displaced rushes up a pipe, and acting on the surface of the oil in the middle reservoir, forces it up to the burner, which is thus continually supplied—being an ingenious application of Hero's fountain to this purpose. In wall, or hanging lamps, the oil cistern, or principal reservoir, communicates by means of a valved opening with a supplementary cistern on a level with the top of the burner. Oil is supplied through an opening in the top of the cistern, closed with a screw cap; when the lamp is lighted, the valve being opened, the oil fills the secondary cistern and rises to the level of the burner; in proportion as the oil is consumed, a continuous supply escapes from the larger into the smaller cistern, and thence to the burner. A rod passes from the valve, through a tube to the top of the reservoir; both that and the orifice of supply being concealed by an ornamental casing with which they are covered. The third improvement consists in an improved mode of constructing concentric wick lamps; the circle for holding the wicks, instead of being made of pieces of tin turned over into a ridge at top, are made of one piece of iron, without any ridge, whereby all risk of leakage is avoided. Vertical wires screwed at the end and acted uopn by nuts, raise or lower the cotton. The fourth improvement relates to gas burners, and consists in the introduc-

tion of one or more perforated diaphragms inside the burner, which is stated to cause the gas to issue in a more equal and uniform manner from the burner. The fifth and sixth improvements relate to signal lights of different colours for steam-vessels, railway stations, &c., that their relative positions may be instantaneously changed, so as to prevent any mistake arising. An argand lamp is gimbled and placed in a reflector with a white glass, in a suitable frame a little above the bow of the vessel. Another lamp with a bright red or other coloured light is similarly mounted over the first, at the extremity of a pole, so centred as to turn either to the right or left, but hanging perpendicularly when at rest, by means of a weight. By means of ropes the red lamp can be inclined to the one or other side of the white light, and thus clearly indicate whether the vessel is on the starboard or larboard tack. Finally, the application of lenses of various coloured glasses, which are made hollow, and slip on to the glass chimney of the lamp when wanted. The claims are:—1. The improved construction of argand lamps, and also the glass chimneys before referred to. 2. The method of feeding table, wall, and other lamps. 3. The construction of concentric wick lamps in the manner described. 4. The addition of perforated diaphragms or other analogous substitutes, to the inside of gas burners. 5. The mode of fixing and working signal lights, as set forth. 6. The employment of moveable lenses to slip over the glass chimneys of lamps, when different colours are required to be used.

LIST OF DESIGNS REGISTERED BETWEEN SEPTEMBER 25TH AND OCTOBER 27TH:

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Sept. 28	416	J. Yates	Table	3 years.
"	417	Ditto	Framework for a steam engine	3
"	418	J. Rodgers and Sons	Contracting clasp	3
29	419	C. Rowley and J. Smeeton	Button	3
30	420	J. Simister	Shoulder strap	3
Oct. 2	421	C. Goodall and Son	Engraved metal roller	3
5	422	F. Harrison	Linen drill	1
8	423	R. Jones and Son	Corkscrew	3
"	424,5	H. B. Elwell	Lantern	3
12	426	Watson and Son	Carpet	1
13	427,8,9	J. and J. Walker	Cantoon	1
"	430	G. Jackson and Sons	Frame for pictures, &c.	1
14	431	J. Ridgway	Machine for burnishing china, &c.	3
16	432	Aspinall and Cross	Grand drill	1
19	433	The Coalbrookdale Company	Stove	3
20	434	T. B. Wright	Dial for railway time tables	3
22	435,6,7	J. Rostron	Cantoon	1
23	438	Rotton and Scholefield	Castor	3
"	439	H. Gardner	Spectacles	3
26	440	W. Mosey	Envelope	1
27	441	J. Fisher	Strap fastening	3
"	442	The Coalbrookdale Company	Fender	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 26TH OF SEPTEMBER AND THE 22ND OF OCTOBER.

Frederick Payne Mackelcan, of Birmingham, for certain improved thrashing machinery, a portion of which may be used as a means of transmitting power to other machinery. October 1; six months.

Thomas Joyce, of Manchester, ironmonger, for a certain article which forms or may be used as a handsome nob for parlour and other doors, bell pulls, and curtain pins, and is also capable of being used for a variety of useful and ornamental purposes in the interior of dwelling-houses and other places. October 1; six months.

William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., for improvements in producing or obtaining motive power. October 1; six months.

William Horsfall, of Manchester, card maker, for an improvement or improvements in cards for carding cotton, wool, silk, flax, and other fibrous substances. October 1; six months.

James Stirling, of Dundee, engineer, and Robert Stirling, of Galston, Ayrshire, doctor in divinity, for certain improvements in air engines. October 1; six months.

George Ritchie, of Gracechurch-street, and Edward Bowra, of the same place, manufacturers, for improvements in the manufacture of boas, muffs, cuffs, flounces, and tippets. October 1; six months.

James Fitt, sen., of Wilmer Gardens, Hoxton Old Town, manufacturer, for a novel construction of machinery for communicating mechanical power. October 7; six months.

John Davies, of manchester, civil engineer, for certain improvements in machinery or apparatus for weaving, being a communication. October 7: six months.

Thomas Spencer, of Liverpool, carver and gilder, and John Wilson, of the same place, lecturer on chemistry, for certain improvements in the process of engraving on metals by means of voltaic electricity. October 7; six months.

Thomas Wood, the younger, of Wandsworth Road, Clapham, gentleman, for improvements in paving streets, roads, bridges, squares, paths, and such like ways. October 7; six months.

Charles Payne, of South Lambeth, Surrey, gentleman, for improvements in salting animal matters. October 13; six months.

Robert Pettit, of Woodhouse-place, Stepney-green, gentleman, for improvements in railroads and in the carriages and wheels employed thereon. October 15; six months.

Henry George Francis, Earl of Ducie; Richard Clyburn, of Uley, engineer; and Edwin Budding, of Densley, engineer, for certain improvements in machinery for cutting vegetable and other substances. October 15; six months.

William Newton, of Chancery-lane, civil engineer, for an invention of certain improvements in engines to be worked by air or other gases, being a communication. October 15; six months.

James Hancock, of Sidney-square, Mile-end, civil engineer, for an improved method of raising water and other fluids. October 15; six months.

Henry Pinkus, of Panton-square, Esq., for an improved method of combining and applying materials applicable to formation or construction of roads or ways. October 15; six months.

Charles Parker, of Darlington, flax spinner, for improvements in looms for weaving linen and other fabrics to be worked by hand, steam, water, or any other motive power. October 22; six months.

Richard Edmunds, of Banbury, Oxford, gentleman, for certain improvements in machines or apparatus for preparing and drilling land, and for depositing seeds or manure therein. October 22; six months.

Thomas Clark, of Wolverhampton, ironfounder, for certain improvements in the construction of locks, latches, and such like fastenings applicable for securing doors, gates, windows, shutters, and such like purposes, being a communication. October 22; six months.

Gabriel Riddle, of Paternoster-row, stationer, and Thomas Piper, of Bishopgate-street, builder, for improvements on wheels for carriages. October 22; for the term of seven years, being an extension of the original letters patent granted to Theodore Jones, of Coleman-street, accountant.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF SEPTEMBER, TO 22ND OF OCTOBER, 1840.

John Lambert, of No. 19, Coventry-street, in the parish of Saint James, Westminster, gentleman, for certain improvements in the manufacture of soap. (A communication.) September 24.

James Buchanan, merchant, of Glasgow, for certain improvements in the machinery applicable to the preparing, twisting and spinning, and also in the mode of preparing, twisting and spinning of hemp, flax and other fibrous substances, and certain improvements in the mode of applying tar, or other preservative to rope and other yarns. September 24.

Alexander Francis Campbell, of Great Plumstead, Norfolk, Esq., and Charles White, of Norwich, mechanic, for improvements in ploughs, and certain other agricultural improvements. Sept. 29.

Amand de Plangue, of Lisle, in the kingdom of France, but now residing at 126, Regent-street, Middlesex, gent., for improvements in looms for weaving. (A communication.) September 29.

George Delianson Clark, of the Strand, Middlesex, gent., for improvements in coke ovens. (A communication.) October 5.

Richard Beard, of Egremont Place, New Road, Middlesex, gent., for improvements in printing calicoes, and other fabrics. (A communication.) October 7.

Robert Beart, of Godmanchester, Huntingdon, miller, for improvements in apparatus for filtering fluids. October 14.

Thomas Farmer, of Gunnersbury House, near Acton, Middlesex, Esq., for improvements in treating pyrites to obtain sulphur, sulphurous acid, and other products. October 14.

LIST OF IRISH PATENTS GRANTED FOR OCTOBER, 1840.

H. C. Rouquette, for a new pigment.

John Hawley, for improvements in pianos and harps.

W. Stone, for improvements in the manufacture of wine.

F. Vouillon, for improvements in the manufacture of ornamental woven fabrics.

M. Poole, for improvements in looms for weaving

J. Lambert, for certain improvements in the manufacture of soap.

NOTES AND NOTICES.

Wood Tyre for Railway Wheels.—Sir,—Although Mr. Dircks is entitled to all the solid advantages, arising from the practical adaptation of the foregoing principle, it is quite clear, that the merit of invention belongs to Mr. John Rivington, jun., whose suggestion to that effect appeared in No. 819, April 20, 1839. The mode of construction adopted so successfully by Mr. Dircks, is highly creditable to his engineering skill, but to the "novelty of idea" he must resign all pretensions, upon the incontrovertible evidence of your pages. Yours obediently,

October 14, 1840. W. B.

New Floating Fire-engine.—A floating fire-engine of great power is now building for the Emperor of Russia, by Mr. Merryweather, engineer, Long Acre, London; it will be worked by four cranks, manned by upwards of fifty men. The engine will be placed in an iron boat, now in course of erection at Messrs. Fairbairn and Co.'s works, which will be propelled by two paddle-wheels driven by the same cranks that work the engine, suitable gearing being employed for transferring the motive power to either at pleasure, upon the plan suggested by Mr. Baddeley in No. 588 of the *Mechanics' Magazine.* This powerful machine will combine several novel and important improvements, and in the facility and rapidity of its transport, as well as in readiness and power of working will greatly exceed anything hitherto seen in this country.

Extraordinary Despatch in Fitting up the "Polyphemus" Steam Frigate.—It will be recollected that the steamer of war *Polyphemus*, of 800 tons burthen, was launched at Chatham on Monday, the 28th of September, the same day that the *London*, of 92 guns, was launched. The former vessel proceeded upon the following Thursday, the 1st of October, to the engineering establishment of the Messrs. Seawards and Capel, of London, who have completely equipped this fine vessel with engines of 200 horses power, with all her fittings, spare gear, implements, and stores, and coal-boxes of wrought iron to contain 229 tons of coals, in the short space of 22 working days. We believe this is the shortest time upon record of a vessel of this magnitude having been fitted. She proceeded down by steam to Chatham on Wednesday, the 28th inst., to take in her masts, being quite completed in her machinery. It is considered that it would require a period of six months in any port out of Great Britain to fit a vessel of war of the same size. There were about 220 men employed by the Messrs. Seawards on the vessel. Her engines are upon the same system as those of the *Gorgon*, *Cyclops*, *Alecto*, and *Prometheus*. The *Polyphemus* will be immediately armed with two 10-inch guns, and will proceed direct to the Mediterranean.

LONDON: Edited, Printed and Published by J. C. Robertson, at the Mechanics' Magazine Office, No. 166, Fleet-street.—Sold by W. and A. Galignani, Rue Vivienne, Paris.

Mechanics' Magazine,

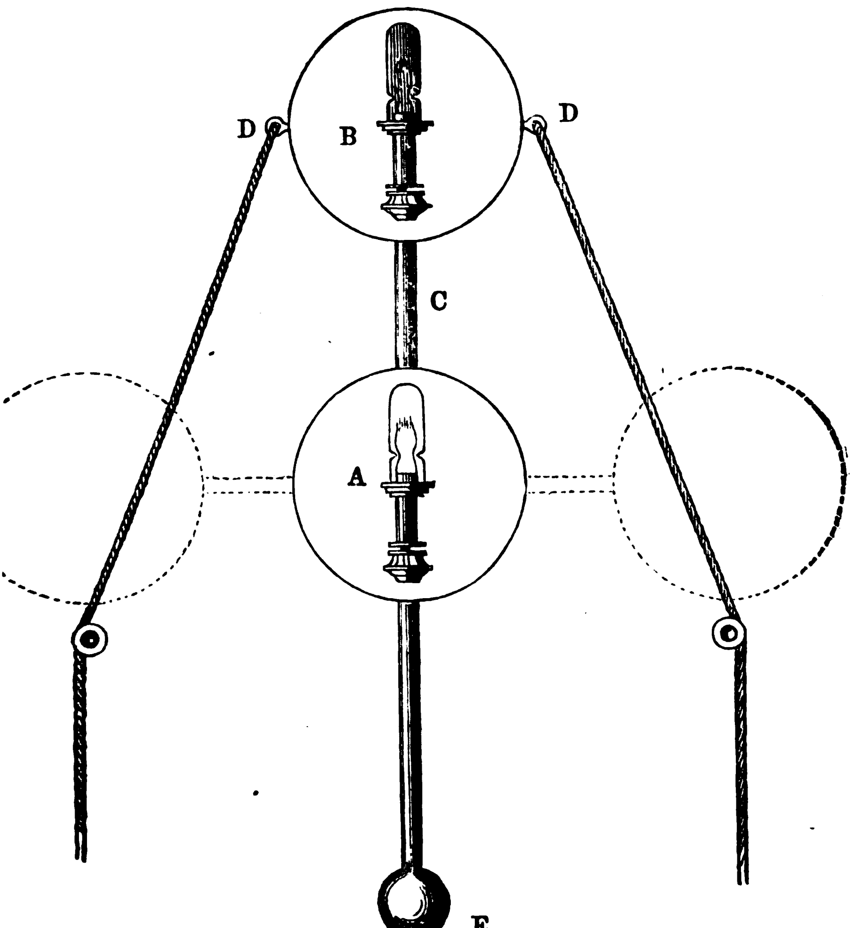
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 900.] SATURDAY, NOVEMBER 7, 1840. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

WILKINS AND KENDRICK'S IMPROVEMENTS IN LAMPS.

Fig. 1.



WILKINS AND KENDRICK'S IMPROVEMENTS IN LAMPS.

In our last Number we gave an abstract of the recent specification of Messrs. Wilkins and Kendrick for certain improvements in lighting and in lamps, and we now return to the subject in order to redeem the promise which accompanied that abstract.

The engraving on our front page (fig. 1) illustrates a very beautiful, and at the same time a very simple mode of exhibiting signal lights of different colours, the employment of which on board of steam vessels, at railway stations, and in various other places, is calculated to avert continual sources of danger. The late fearful collision between the *Phœnix* and *Britannia*, shows the necessity that at present exists for some judicious and well-understood provision of this kind, by which such deplorable accidents might be prevented. The Corporation of the Trinity House have recently framed and promulgated the following "rules of the road" for preventing any future misunderstanding on this point, which, on communicating with the Lords Commissioners of the Admiralty, the Elder Brethren find have been already adopted in all the steam vessels in her Majesty's service:—

"1. When steam vessels on different courses must unavoidably or necessarily cross so near that, by continuing their respective courses, there would be a risk of coming in collision, each vessel shall put her helm to port, so as always to pass on the larboard side of each other.

"2. A steam vessel passing another in a narrow channel must always leave the vessel she is passing, on the larboard hand."

The advantage of having some ready mode of showing that these regulations are known and will be observed, as also of enabling approaching vessels clearly to see the tack on which each is standing, will be at once recognized. There is a great superiority in moveable over fixed lights, in the extent to which they can be made useful as signals for these and other purposes. The manner in which all these advantages are realized by the patentees in this instance will be clearly perceived on reference to the engraving, with the aid of the following brief description:—

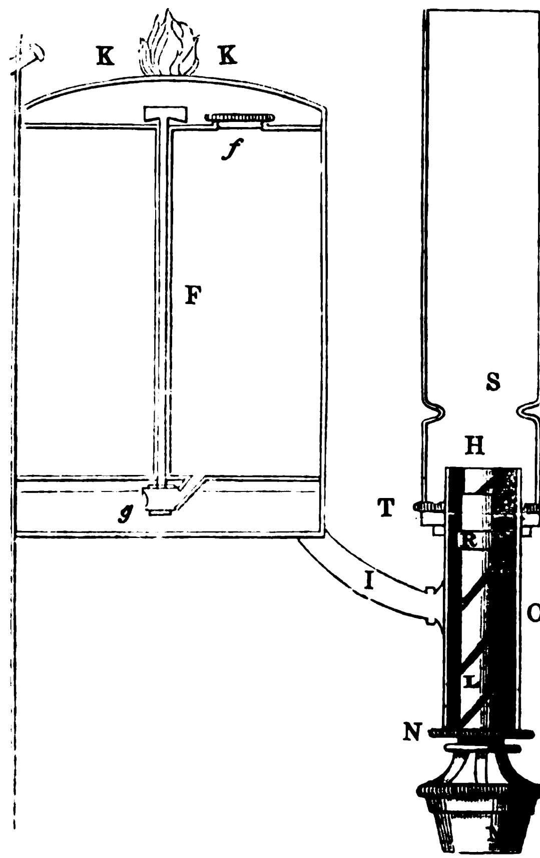
An argand lamp A is gimbled and placed in a reflector with a white glass chimney, and fixed by means of suitable framework a little way above the bow of the vessel. A second lamp B, similarly gimbled, is placed within a reflector, and fitted with a *red* or other bright coloured glass chimney. This lamp is affixed to the upper end of a pole C, so as to be supported immediately over the lamp A. The pole moves freely upon an axis placed in its centre, so as to be readily inclined either to the right or the left, but when left to itself it preserves its vertical position, in consequence of a weight E being attached to the lower end of the pole. Two ropes are attached to the rings D D, by pulling of which the lamp B can be brought down to a level with the lamp A on either side, and thus be made to indicate that the vessel is keeping either the starboard or the larboard tack. When the rope is released, the action of the weight E restores the lamp B to its original upright position. The mode of showing a coloured light, by means of coloured glass chimneys, (noticed in our last) strikes us as being a novel and ingenious contrivance.

Having thus noticed one of the useful applications which may be made of the lamp, we now proceed to point out some of the peculiarities and improvements embodied in the construction of the lamp itself.

Fig. 2 represents an improved wall, or hanging lamp upon Argand's principle. As hitherto made, the oil reservoir has always had to be unscrewed from, or lifted out of the case of the lamp, and to be inverted in order to fill it with oil; an operation which is hardly ever accomplished twice without spilling and wasting the oil, to say nothing of the uncleanliness of the operation. In Messrs. Wilkins and Kendrick's lamp, the principal reservoir F, is filled with oil through an orifice *f* at the top, closed by a screw cap; the oil is admitted through a valve or cock *g*, into a secondary reservoir, the top of which is a little higher than the top of the burner H. On opening the valve *g*, the oil fills the secondary reservoir and flows through the pipe I into the burner H, till it attains the same level in both. In proportion as the oil is consumed, the oil passes from the upper to the lower reservoir, and thence to the burner, where the level

Fig. 3.

Fig. 2.



is constantly maintained without any overflow. The orifice for filling *f*, and also the handle of the valve, may be concealed by an ornamental cover K K, removeable at pleasure. The burner is altogether novel in its construction. An internal tube L is connected with, and rises from the oil cup M, held by, and turning freely within a ring N. On the external surface of the tube L a spiral groove is cut from top to bottom. O is the outer case of the burner, having a groove formed on its inner surface, by two strips of metal, shown in section by *p p*, fig. 3. R is the cotton holder, having a pin or peg passing through it, which takes into the vertical, and also into the spiral grooves, so that when the oil cup M is turned, the cotton holder moves up or down according to the direction in which motion is given. By this simple arrangement, the flame of the lamp may be adjusted without taking off the glasses, and the consequent risk of breaking is therefore entirely obviated: while from there being no inner revolving case, nor rack and pinion, the tubes of the burner are made smaller and more compact than usual. S represents a glass chimney of one of the improved forms included in the patent, resting on the gallery T. This form of glass causes the ascending column of air to incline towards the flame, rendering the combustion exceedingly perfect, and evolving the greatest possible quantity of light.

CURIOUS PNEUMATIC PHENOMENON.

Sir,—If you should consider the following account of a trifling but curious experiment worthy of a corner in your pages, I shall feel much obliged by your inserting it.

Some time since, while making some pneumatical experiments, merely for amusement, I took a white earthen jar and cover, of the same kind as those used by chemists for extracts, &c., and filled it with water; and, putting on the cover, I inverted the jar and placed it on a table; when, of course, I was not at all astonished to find that the water remained in the jar; for, under these circumstances, the cover of the jar merely replaced the saucer, which lecturers use when they transfer gases from place to

place, though, it must be confessed, that the cover is a very greatly improved substitute for the saucer. It now occurred to me, that if the jar was lifted from the table by the now upper end of it (or by that which would have been its lower end if it had not been inverted), the water would not run out of the jar, but that the cover would follow the jar, the water remaining in the jar. I made the experiment, and found my idea was justified by the result.

I am not aware that this partly pneumatical experiment has ever been before made, it being with me entirely original. It is not dependant upon any sticking between the jar and cover, for, if the cover be slightly touched, it will be seen that there is no contact between the jar and cover, but, on the contrary, a film of water between them. I have used various sized jars, and found the same result ensue with all; but the largest jar has not been greater than 5 inches in height, and 3½ inches in diameter.

The experiment will not generally succeed if the jar be not held upright, nor will it if, in lifting the jar from the table, there should be any adhesive action, by a layer of water or otherwise, between the table and the cover of the jar. In order to obviate this source of failure, the jar may be raised from the table by placing one hand under the cover, and when the jar is at a proper height, by removing the hand from under the cover, holding the jar by the other hand. But, from some of the proper conditions of the experiment not being always accidentally fulfilled, the cover will sometimes fall off, and the water splash about. In order to avoid inconvenience in this respect, I should advise that the experiment be always made over a wooden tub or pail.

It does not seem to me at all difficult to explain the causes of the sticking result of this experiment; but as by far the greater part of your readers will be able to arrive at an explanation of themselves, I do not give any further than saying that the experiment is not purely pneumatical.

With every apology for trespassing upon your space,

I remain, Sir, your humble Servant,

J. P. HOLEBROOK.

118, Devonshire-place, Edgeware-road,
21st October, 1840.

THE NEW THEORY OF THE UNIVERSE.—(VIDE PAGE 409, NO. 898.)

Sir,—It would not be difficult to answer the question of "E. A. M.," without his theory, respecting the billiard ball; but he informs us (vol. xxxiii, page 366,) that he is no mechanic, and in accordance with his theory, many things appear to him in a different light to that in which they are viewed by others—and he finds these many things are not well understood by any one. Now he tells us, as he is no mathematician, that he is desirous of having his question answered in plain English—but who is he then, and what is that plain language he will be disposed to understand? Have I to create a new theory of language to answer his question? for his theory does not change the calculation, which can be made by the other supposed theories of the universe. In his, as in many others, I find two principles—the names only are changed; but they are always the attraction and the repulsion, and between both the *inertia* of matter, which is instantly ready to obey the strongest impulse. And there I find the plain principle of all motion whatever, from the atom to the billiard ball, and from this to the sun, which is the centre of a system, but not that of the universe. The exhalation and the absorption, of the new theory, appear to me to be an effect, and not a cause in nature. I may be wrong; if so, I wish for an explanation from "E. A. M." in plain language, for I am a mechanic, and in exact terms, for I am a mathematician.

R. C.

October 26, 1840.

[We beg to inform our correspondent that he is mistaken as to the *sex* of his opponent. ED. M. M.]

THE ASTEROIDS OF NOVEMBER.

Sir,—As the season for the periodical appearance of the November meteors approaches, permit me to urge on such of your scientific readers, whose love of the science of meteorology will compensate them for the fatigue of foregoing three or four hours of their accustomed repose, on the nights of the 12th and 13th of this month—the utility of making accurate observations on the most brilliant of them, noticing their apparent

place in the Heavens in which they disappear, and the precise moment of such occurrence. If simultaneous observations of any meteor were made at different stations, the real distance of such luminous body above the surface of the earth, could be readily ascertained, by the solution of one oblique triangle, in which the distance between each observer, with two angles are known, to find one of the other sides, which gives the horizontal distance of the meteor from one station: and its perpendicular height may be found by the solution of one right-angled triangle, where one side and its adjacent angle form the given parts. The observer should endeavour to take the *azimuth*, and *altitude* of the spot where they *disappear*, noticing also the mean time with as much accuracy as the circumstances will admit of with their *apparent direction* in the visible Heavens.

Should any young meteorologist feel disposed to make the observation specified above, and would be kind enough to favour me with a copy of the same, I should feel much obliged, and with your permission, should they prove available for the solution of the problem acquaint them with the results through the medium of your excellent Magazine.

Should you think the above remarks not derogatory to the usual topics of your useful periodical, by their insertion in your next week's publication, you would greatly oblige,

Your humble, and respectful servant,

J. T. GODDARD.

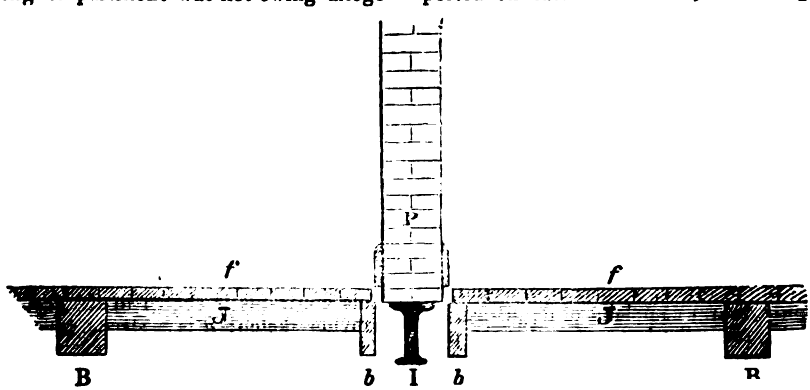
2, Clare-street, Bristol, Nov. 2, 1840.

P. S. Correspondents would please to state their latitude and longitude.

IMPROVED METHOD OF HOUSE BUILDING.

Sir,—The rapidity with which fires spread in houses where the sub-divisions are made by framed partitions covered by lath and plaster, makes it very desirable that some mode of constructing fire-proof partitions should be more generally resorted to. Brick or stone partitions are obvious substitutes, but when sub-divisions on one floor occur, over voids in the floor below, their weight is a serious obstacle, as even when expensive trussed beams are employed to support them, they are still found to sink, and the ceilings under them soon begin to show cracks.

Having been led to think that this yielding of the trussed beams and sinking of partitions was not owing altogether to their absolute weight, but was rather caused by the constant vibration of the floors from the movements of the occupants, and having accidentally noticed some years ago in one of the new hospitals here a case of a stone partition between two chambers, which passed over the middle of a large room below, and having observed that from the way the floor was supported it would have very little action on the trussed beam supporting the partition, I resolved on following out the same principle in a house I was then about to have built for my own use, and in erecting it I caused all the partitions which were not over bearing walls coming up from the foundation, to be supported on cast iron beams, and along



each side of such iron beams, a half beam of wood being laid with a clear interval of an inch between them and the flanch of the iron beam, so that no motion could be communicated from them to the partition.

This construction appears to afford all the advantages I anticipated, as no shrinking is discoverable, although one of the partitions is made to carry a flight of a geometrical stone staircase to the attic story.

The main advantage I proposed to myself in this, was the attainment of security against the quick spread of fire, but I find the benefit of the non-transmission of sound, and of doing away all harbour for vermin, is sufficient to induce any one wishing to have a comfortable house, to follow the same construction, which is fortunately by no means an expensive one.

K. H.

Description of the Engraving.

P is the brick partition; B B, the beams, and *b b*, half beams; I, a cast-iron beam; *f f*, is the floor; J J, the joists.

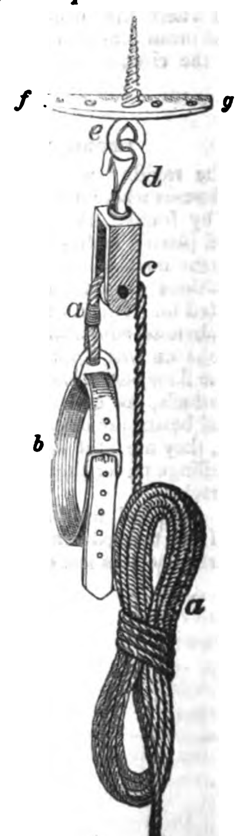
MERRYWEATHER'S DOMESTIC FIRE-ESCAPE.

"We cannot withhold the suggestion that more than one of the machines intended for domestic use only, to be resorted to by inmates of houses in case of fire, might be introduced at a trifling cost into houses with great advantage; especially in neighbourhoods not immediately within the reach of more public appliances."—*Messrs. Harvey and Braidwood's Report.*

Sir,—While the gentlemen quoted above were investigating the fitness of various public fire-escapes calculated for external application, they seem to have been very strongly impressed with the notion that it was the bounden duty of housekeepers, each to provide for the safety of his own establishment. "When it is known," say they, "that easy means of descent from the loftiest apartments of a house may be permanently obtained at a cost considerably under 60*s*., *an obligation is imposed upon the heads of families*, which, to disregard, would not only disarm complaint of its justice, but strengthen the impression that the public are too prone to reply upon external agency, and to throw aside the precautions of individual prudence."

A correspondent in a daily journal expresses a desire to be made acquainted with some one of these machines, which, at a trifling cost, would ensure the requisite protection. In order to supply this information, and remedy a deficiency which has been complained of by more than one individual, I beg to hand you a description of the following apparatus, which is peculiarly adapted for the purpose stated.

Merryweather's portable fire-escape ladders* are recommended for general adoption in the city, and the safety belt, rope, and pulley, detached from these ladders, *forms the best and simplest domestic fire-escape that can be employed.*



This apparatus is shown in the accompanying sketch: *a* is a strong rope, its

* Described in Vol. xxvi. page 450.

length being equal to twice the height of the building in which it is to be used; *b* is a broad leather belt and buckle; the rope *a* passes over a small brass pulley *c* attached to a snatch-hook *d*, and this forms the whole of the apparatus. This fire-escape may be stowed away in a window seat, in a small box or bag under the bed, or in a cupboard. It is, of course, necessary to make some suitable provision for hanging it up to, for use; this is conveniently done by fixing an iron ring *e* to a beam over the window, by the taper screw, still further secured by four wood screws in the ears *f g*.

In the event of fire, the escape is to be hooked on to the ring above, and the rope cast free into the street; the belt being buckled round the waist of any person, he is to be put out of the window and lowered, his descent being regulated by those below holding on to the rope. The person lowered may, if he pleases, keep a check upon the rope himself, by passing it through his hands. Where it happens that there is no trustworthy bearing above the window, the ring may be affixed to the floor, in which case, from both ropes running upon the window ledge, so much friction will be generated that a female might easily lower herself in perfect safety, without any extraneous aid. Increased friction is sometimes produced by the introduction of a second pulley close under the first.

Domestic fire-escapes of this description have already been pretty extensively adopted. The Chapter Coffee-house in the city, is fitted with them both back and front, and there are several others in the same locality, provided immediately after the melancholy fire in Ivy-lane. In a case or two that has come to my knowledge, the second and third floor windows, back and front, have been provided with ring staples, and the rope and belt deposited in a marked cupboard in one of the landings. This, however, is a very objectionable arrangement; for, in case of fire, it is about ten chances to one, that all access to the staircase is completely cut off by the ascending smoke, &c., in which case the escape is unattainable. The better plan is, to fix the escape on the highest floor where any person sleeps, because it is perfectly available from that point to all the lower floors.

Cradles, and bags of various kinds, have from time to time been recommended, as useful appendages to a fire-escape; I have found from considerable experience, however, that *the belt* is infinitely superior to every other contrivance; it is safer, and much more expeditious in its application.

From the strange and unaccountable plan of procedure, which the city authorities have chosen to adopt—from the recklessness of consequences which they have exhibited, it becomes more needful than ever for heads of families to make some provision for self-preservation.

With the simple apparatus I have here described, and a small rattle, fatal consequences could hardly accrue: the rattle is sure to obtain the instant attendance of the police, who would give every possible assistance to effect the rescue of those who might be endangered, which this escape would enable them promptly and safely to accomplish.

By a trifling outlay once incurred, future safety may thus be effectually secured, and the public cease to be the victims of civic procrastination, or the dupes of designing men.

I remain, Sir, yours respectfully,

WM. BADDELEY.

London, November 29, 1840.

CITY FIRE-ESCAPES.

On Thursday, the 29th ultimo, at a Court of Common Council, Alderman Thomas Wood brought up a report from the Police Committee on the subject of fire-escapes. After a short preliminary review of their proceedings, the committee submitted the report of Messrs. Harvey and Braidwood,* and noticed their recommendations in detail, concluding with the following remark:—"We, your committee, agreeing with the principle of the said report, beg to recommend to your honourable Court to refer it back to your committee, to carry into effect so much thereof as may from time to time be found necessary." Alderman T. Wood then moved that the report should be agreed to; Mr. Hicks seconded that motion. A discussion then followed, in which Mr. King remarked that any sum of money would be well bestowed in the endeavour to establish protection or escape.—Mr. Taylor admitted

* Inserted at page 437.

the propriety of what Mr. King said, but he did not see why a larger sum than was necessary should be expended. In cases of this kind, which appealed to all hearts, it was no difficult matter for selfish people to carve out what would answer their own purposes.—Mr. R. L. Jones said, that a great deal of credit was due to the committee; but he thought it would be proper to call their attention to the necessity there would be for some place in which to keep the machines. Now in his ward, a great difficulty had occurred as to the parish ladders: they were first kept in the churchyard, but when a fire broke out they were not to be had; they were afterwards placed against the wall of Whitecross-street Prison, but the prison keeper complained that the inmates would find some use for them. They were, in fact, like a parish pump—all the neighbours delighted in the acquisition, but not one wished it to be at his door. He trusted this difficulty would be looked to.—Alderman T. Wood said, that the difficulties which must necessarily attend the measures recommended by the committee had not escaped their consideration; they had, therefore, resolved to proceed step by step. It appeared to them advisable to place the machines in the custody of a person regularly [query *specially*] appointed; and it was their intention to commence operations with three or four machines, as the report indicated; and perhaps it would be found, when the arrangements were complete, that half-a-dozen would be sufficient. The committee would take care to guard against the possibility of a profuse or unnecessary expenditure, by not letting a shilling of the money out of their own hands. As the Society of Arts had been alluded to, he thought it proper to notice the great kindness with which their deputation had been received, and the pains taken by the authorities there to exhibit the models which they possessed. These models, however, were complicated, and indeed impracticable, compared with those of recent invention; and even the latter, the committee would have to improve, by a combination of different excellencies perceived in the designs exhibited in detail. After all, the thing was merely experimental, and the committee would act with all desirable caution.

The report was then unanimously agreed to.

It has been observed, that "in the multitude of counsellors there is safety," but that remark applies as rarely to the collective wisdom east as west of Temple Bar. We have here a subject, most truly described by one of their body (Mr. Lott) as "of the most vital nature—one that could not brook delay;" and yet we find those entrusted with the execution of the business, proceeding "step by step"—acting with "all desirable caution"—beginning with "three or four machines"—and expecting to find at last "that half-a-dozen" will be quite sufficient. And this, too, in the very face of a report, with the principles of which they profess their agreement; wherein it is expressly stated that less than *twenty* sets of portable ladders, and *ten* sets of a larger description, *will in actual use prove unavailing!* An authority of no small weight on this subject (Mr. Baddeley*) ventures to doubt the sufficiency of even this arrangement, and expresses a conviction "that less than *sixty* fire-escapes will not be sufficient to ensure the complete protection of the citizens;" and also shows at how trifling an expense this highly efficient protection could be obtained.

Thus, after four months industrious application to the investigation of the subject, assisted in their enquiries by the City Police Commissioner and the Superintendent of the London Fire Establishment—after examining 44 designs for a fire-escape, besides making a useless pilgrimage to the Adelphi, the Police Committee declare that the matter they are about to proceed with is—MERELY EXPERIMENTAL! Gracious heavens. *An experiment!* between the *£ s. d.* of the Corporation on the one hand, and *the lives of their fellow-citizens* on the other. Can such things be? And these are the men, forsooth, who are going to "*improve*" the excellent designs submitted to their inspection "by a combination of the different excellencies perceived in the designs exhibited in detail!"

"Another fatal fire in the city" will shortly be the cry, and then let the authorities be overwhelmed with shame at their tardiness to avail themselves of the practical skill and experience offered for their adoption, and stand self-convicted of withholding in a mercenary spirit the paltry sum by which such a calamity could have been prevented.

* Vide page 436 of our last Number.

APPARATUS FOR REGULATING THE DRAFT OF LOCOMOTIVE ENGINES.

Fig. 1.

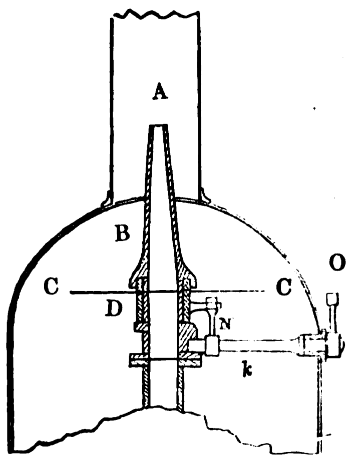


Fig.2.

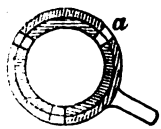
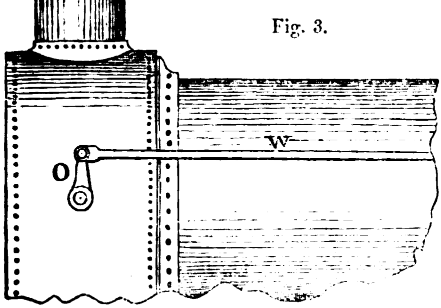


Fig. 3.



Sir,—In consequence of the powerful draft required in the furnace of a locomotive engine, it has been found necessary to contract the orifice of the waste steam pipe, which projects up the chimney. The contraction of this orifice, although absolutely necessary to cause a sufficient draft, has been carried to so great an extent as to reduce in a great measure the power of the engine.

There are undoubtedly occasions, and very frequently too, when not so great a draft is required; therefore a contrivance capable of increasing or diminishing the size of the orifice, and consequently the quantity of steam forced through it, is necessary. This may be accomplished by the following method, which suggested itself to me a few days ago, and which I think will be simple and effective. I trust you will not for a moment suppose that I pretend to be the first inventor of a blast regulator, (if I may be allowed to give it a name,) but as far as my information extends, the following is different from, and simpler than any contrivance hitherto made use of for the same purpose.

A, fig. 1, is a section of the waste steam or blast pipe; B is the contracted orifice through which the steam is forced, after it has worked the piston; D, is a hoop, or ring, about 5 inches long, adapted to the outside of the pipe A, so as to work easily round it. This hoop has three oblong apertures in its side corresponding with three in the pipe A, as shown at fig. 2, which is a section through the line C C; *k* is a spindle furnished with two levers N O. The lever N is connected by a moveable joint to the projecting arm of the hoop D. To the lever O, which projects a little beyond the side of the smoke box, is attached the rod W; fig. 3, which runs along the side of the boiler, and is under the immediate control of the engine man.

By attention to the figures, it will be seen that the moving of the rod W, will cause the hoop D to move round the pipe A, and consequently, open or shut the apertures *a a a*. By this means the steam, instead of being forced through the narrow orifice B, may be allowed to escape through the apertures *a a a*, which may be opened and shut at pleasure.

The principal intention of this contrivance is not to regulate the draft, but to allow the steam, when the draft will admit it, to escape more freely from the cylinder, after it has worked the piston, which will add very considerably to the power of the engine.

I am, Sir, yours respectfully,

John C. Pearce.

Leeds, October 15, 1840.

IMPROVEMENT IN OMNIBUSES.

Sir,—An idea having struck me, which might, I think, be useful, I should be obliged by its insertion in your valuable journal. It is a contrivance for facilitating the transit of passengers in omnibuses, and is this:—To elevate a platform of about 3 or 4 inches high and as broad as could be conveniently made, along the floor of the omnibus. As it would be supported by pillars placed at convenient distances, those sitting would have the same room for their feet as at present.

If the height of the omnibus was insufficient, an elevation of a corresponding breadth might be made in the roof; the sides of this elevation being fitted with revolving blinds would furnish an excellent system of ventilation.

I am, Sir, yours, &c.

A. H. P.

Somers Town, October 27, 1840.

SYMINGTON'S CONDENSATION.

Sir,—Though I think there is room for much reasoning in favour of this system in answer to Mr. Fox, short facts are perhaps the best replies to long "impossibilities." I beg, therefore, to inform this gentleman, that this plan was applied four years ago to the *Dragon* steam tug of 80 horse power at the risk of the patentee, who was not to be paid for it unless the proprietors were satisfied. It *was* approved of and has since been, and still is in constant operation on the Thames. During these four years the proprietors have been at no expense for the boilers, and Mr. Jeffrey, of 18, Burr-street, Wapping, will, no doubt, confirm on application, what he told me a few weeks ago, that whilst another boat of less power (35 horse power) belonging to the same parties (since sold) had cost 200*l*. for repairs owing to encrustation, the *Dragon* had cost nothing for such repairs, though both boilers were supplied at the same time, and both tugs equally employed in the same business. About 18 months ago I was on board the *Dragon*, and saw Symington's plan tried for *two* "consecutive hours" without any mixture of external water; then the old plan was turned on, worked for two hours; and again, S.'s plan, and so on alternately until ten o'clock at night. I saw the coals weighed, and counted the revolutions, and carefully took down the results. There was a saving of fuel of more than a fourth with S.'s plan, though the usual injection commenced always on clear boilers, and one revolution more of the wheels in favour of the patent system was conclusive that the engines "worked up to their full power." Another tug, *Fletcher's Dispatch*," is now, I am told, in a satisfactory working order at Hull and Goole, but as I do not know this except from report, Mr. Oldham, who resides at the former place, and thinks so highly of Mr. Hall's, will perhaps be so good to ascertain the facts and oblige your readers.

I am, Sir, your humble servant,

DICK, TOM OR HARRY.

October 27, 1840.

On the same.

Sir,—By way of apology for again trespassing on your columns on this long subject (which, after so much indulgence, I do very unwillingly), I beg to refer to my communication in your 900th Number, wherein will be seen the incidental manner in which I was led to express an opinion of the superiority of Mr. Symington's system of condensation. Neither "R. S. M." nor "Honestometer" (in whose last, by the way, is a terrible mistake, and who will *not* see what is plain enough to two other writers) having continued their remarks to the contrary, I should not now renew the discussion, but for Mr. Fox's paper in your late number, who has taken up the question in a tone and manner, and with a strict adherence to the matter in hand, deserving of general adoption. I am therefore unwilling to let my opinion rest upon mere assertion, without endeavouring to support it by some show of reason, particularly after the decided inference that must arise from Mr. Fox's paper, that it is a silly fallacy. This gentleman (basing his decision upon Mr. Hall's experiments, which, in my opinion, are very inconclusive, and were not conducted with that talent which certainly belongs to him) asserts "that the doing of that which Mr. Symington and Mr. Howard propose *is totally impossible*," and then urges "one important matter which must *inevitably render their methods of condensation abortive*."

It seems to me that if Mr. Hall can cool down 13 gallons a minute from 225° to 60°, there is nothing *a priori* why Mr. Symington cannot reduce the temperature of 1200 gallons from only 100° to 60°—being in his favour, as regards temperature, so great a difference as 125°. Still less can I see anything in the experiments of Mr. Hall, and the trial on the *Londonderry*, to show the difficulty. Experience has taught me to pay little attention to *Certificates* if opposed to first laws, and experience has also taught me to place far less reliance upon reported failures, where the inventions have appeared to me based upon sound principles. Let us apply that experience to the systems of Mr. Hall and Mr. Symington. Mr. Fox tells us your correspondents have fallen into great errors respecting the former, but as he does not point them out, and as I believe that among scientific men, the fallacy of Mr. Hall's condensation is now pretty well admitted, notwithstanding the numerous certificates in its favour, I will pass to Mr. Symington's failure and Mr. Hall's experiments. Had Mr. Hall applied the surface mentioned by Mr. Fox, or somewhat more, to cool the injection water in the same minute division as Mr. Hall now finds indispensable for surface condensation, he would, I doubt not, have arrived at quite a different conclusion. The pipes were 7 inches in the experiment—they are half an inch only in the latter system! With pipes anything like 7, or even 4, or 3 inches diameter, the water would rush, in almost an undivided, undisturbed body, into the condenser; and although partaking in some degree of a double motion, the particles of water would not have time to change their position, to be reduced to the required temperature. The pipes in the *Londonderry* were, I am told, one of 4 inches diameter to each engine, running from the hot well by the keel to the bow, thence to the keel, and returning to the condenser. Had I been told such a pipe had performed proper condensation, I should have doubted the fact. Here the same cause was in operation, but had the water been minutely broken up by checks in this pipe, or had there been four pipes of 1 inch, instead of one of 4 inches, the effect must have been different; for it will be seen what an admirable condenser is the open sea or river, and with what rapidity every particle of heat would, with proper surface, be swept away by the speed of the vessel. It was a bold and original thought to get rid of force pumps and condensers, expense and loss of power, by placing the pipes in so perfect a cooling medium, and where, in my opinion, they are as safe as the keel, and being parallel to the vessel way, offer as little impediment as her sides.

I have passed over Mr. Howard's system, because Mr. Symington's is the one more particularly referred to as having failed, and I was desirous of being as brief as possible. That the latter is considered a failure by every steam shipping company I know; I do not hesitate to admit, and Mr. Fox has correctly stated, that it was found necessary to use a portion of the usual injection with the other. At the same time I am equally ready to maintain that it has got a bad name more from the manner of its introduction, and the bad taste in which it was sought to be thrust down the throat of one Company, than from intrinsic defects; and it stands a pretty good chance of being "for ever fallen," from what I can learn. I might here repeat a conversation with a talented Director on this subject that might not be useless to inventors, but as

————————" I protest
Against all evil speaking, even in jest,"

I content myself with this admission, that Mr. Fox has some reasons for considering it, as others do, a failure. I will, however, further venture to express an opinion, that when this plan shall become properly investigated and understood, it will be considered one of the most valuable adjuncts to the more general adoption of steam navigation for long voyages, than any improvement since the creation of this Material God, by the late Mr. Symington—that talented individual, who, with so many more before him, has suffered the pangs of unrequited genius; for in his brain was indisputably kindled that early spark which has since dawned into a clear and steady light, but which no longer astonishes the world, only because mankind, accustomed to the brilliancy of the inven-

tion, have lost their admiration and gratitude in its common enjoyment.*

It may, perhaps, save time, if at once I endeavour to remove those prejudices which, in conversation, I have heard urged against Symington's system. There are two: one that the pipes impede the vessel—the other, their exposure to injury; both erroneous, as a little consideration will render apparent. It was on the first ground that the pipes were removed from the *Londonderry*—not from any inability to offer sufficient cooling surface; but this, if I am correctly informed, is disproved by the fact of the vessel having performed six passages across the Bay of Biscay with more steam, with boiler free from encrustation (proving, by the way, how little sea-water could have been required), and failing to make her voyages when they were removed. Admitting that the pipes present somewhat more surface than the part they cover, and that, consequently, there *must* be more resistance, yet I think it is so minute as to be incapable of ascertainment; just as two charges of gunpowder fired by galvanic action through a wire of many hundred yards, one being at the commencement, *must* present *some* difference of time between the stroke and the discharge at either end, yet the eye takes them in so simultaneously, that the finest second hand cannot detect the variation, and no mental operation can determine it. Further, in regard to any obstruction to the speed, I would refer to *the Eclipse*. This vessel condenses throughout her length and breadth by the water passing over that space, entering at the bows and passing out at the stern, having, I believe, a double bottom. Here the water must be pent up, struggling to escape, and causing by its weight far more resistance than could occur with Symington's plan. Why the pipes are more liable to injury than the copper sheathing of the vessel, it would be difficult to find a satisfactory reason. A neat ship's carpenter would so fine them at all salient points by a protecting shield as to offer no practical resistance, and render them difficult to be got at, whether on the vessel grounding or otherwise. But if injured, the facility of resorting to the common injection, as mentioned by Mr. Fox, removes all objection on this point. There is one extra advantage, however, belonging to this plan which does not seem to have occurred to the inventor—at least it was not known in the *Londonderry;* it is this: that if the pipes be properly applied, then is removed that "*impossibility*" of Mr. Hall's [to mechanical science, *ce mot n'est pas Anglais*, Mr. Hall! if you will allow me to transpose Buonaparte's celebrated aphorism] "of regulating the quantity of injection water according to the speed of the engines, whereby great danger arises of choking the condenser and the air pump, and of even breaking down the engines, and of deducting greatly from the power of the engines," &c. Why—all this "*impossibility*," I repeat, is rendered possible. The engineer need not, at least so it seems to me, pay any attention to the injection water, which very beautifully is self regulating without the addition of a pump or any machinery whatever. And this simple principle, if I mistake not, will add something worth having, to the power of the engines. [Talking of increase of power, by the way, how *could* you, Mr. John Fox, in your celebrated letter to the Admiralty, tell them of an increase of power of one-fourth, besides a saving of one-fourth of fuel by the use of these said "perfect" condensers? Surely the *Queen's* directors would have applied them to the *President*, had they found the duty of the engines of the *Queen* raised from 500 horse-power to 750!

* To avoid being misunderstood, I allude to Mr. Symington as the practical not the ideal, inventor of steam navigation; the first who in this country had the courage to set about it, the energy to persevere, and the ingenuity to overcome every obstacle to its accomplishment; who was rewarded by the distinguished honour (alas only the honour!) of propelling the first really efficient steam boat of the world; and to whose triumphant success may clearly be traced the subsequent growth in America, and then, in this country, of this stupendous power. I must own I give little credence to the foggy story about Blasco de Garay, in 1543, and doubt that the Marquiss de Jouffroy's boat on the Soane in 1781, would have established, as did Symington's, the practicability of steam navigation. It would at the same time, be unjust not to award a very prescient genius to Jonathan Hulls, who (now a century and four years ago, did his genius so expand as even to contemplate such an extensive application of his thought!) modestly offered this palpable personification of the fabled Neptune of a darker age to an unbelieving generation in these prophetic words:—"The scheme I now offer to the world is practicable, and if encouraged will be useful, and I hope, that through the blessing of God it may prove serviceable to my country."

This obtuseness on the part of the correspondents of the *Mechanics' Magazine* —their inability to discover it—may be one of those "great errors they have run into."]

In taking leave of this subject (unless called upon for explanation,) permit me to remark, in conclusion, why I prefer Symington's system of condensation to all others. I will first assume there is no real "*impossibility*"—that as Mr. Hall does reduce the steam which produces the 13 gallons of water to the temperature of injection water, Mr. Symington can do so likewise. In both cases this same quantity of caloric has to be taken from the same quantity of steam, (a little in favour of S., because some water is returned from the hot well to the boiler,) and this Mr. Hall effects entirely by surface, whilst Mr. Symington does it first by injection, then by cooling that injection. Whether the *last* plan is "impossible" (as Mr. Fox states,) under a judicious application of means can alone be determined by experiment. That Mr. Howard *has done it effectually* he has positively stated, and this, in my opinion, was under less favourable circumstances than the external condensing of Symington. Setting aside the inconclusive experiments referred to by Mr. Fox, (supposing, for instance, Mr. Hall had with precisely the same means tried surface condensation, what *then* would have been the result, and would any reasonable man consider it conclusive?) I am entitled to assume that the thing can be done and done well. Now I judge of every invention not more by what it effects than by its means of accomplishment. Symington's unites more than any other plan I am acquainted with, the criterion of useful invention stated in my second paper in your No,* simplicity in the means, and efficiency in the end. Any thing more simple cannot be. A few pipes is all the invention. Nature does the rest. Evils of so great magnitude, removed by means so simple are the evidences of its excellence. On this account it must be far cheaper in its first cost than others. Little labour can be needed in its application, and as no contraction or expansion can occur, few joints are required, and these the admirable "autogenous soldering" would probably render unnecessary, or nearly so. Thus, durability and little liability to get out of order from imperfect joints, are insured, for these are the conditions of simplicity. No force pumps are required, and no lumbering condensers—the open sea having given one to the inventor as perfect as eternal. The plan relieves the engineer from all attention to the injection, which regulates itself with the ease and unchangeable obedience of Nature's laws to the wants of the engine. Should the pipes be broken, the very accident causes their old plan to start into simultaneous action. Well-regulated companies sight the bottom of their steamers every six months, giving sufficient opportunity for inspection, though when the pipes are injured, I would rather not be in the vessel, for it must be of that serious nature as would at the same time place her in considerable peril.

If you think these observations for the faith that is in me are equally entitled to consideration, as the experiments referred to by Mr. Fox in evidence of the "impossibility" of Howard's and Symington's plans, and if not tired of the subject, you will perhaps find space for this paper, which may thus introduce into notice (like Mrs. Johnson's soothing syrup) "a *real* blessing" to the steam navigation world.

I am, Sir, your obedient servant,

SCALPEL.

October 26, 1840,

Postscript.—Overwhelmed as you seem to be with communications, I am reluctant to add my paper sent you this week, but as the condensation question appears to have attracted some little attention, you will, perhaps, let me correct, through your pages, an error or rather misconception, of the injection plans which the writer of "Notices of Steam Navigation," has fallen into in the *United Service Journal* for the present month. Before doing this I would observe, in reference to Hall's condensation which is there commented on, that no where will the writer find anything to support his observation that—"it appears to be admitted by all *unprejudiced* persons that the condensation by surface is (at least) as sudden and complete as by injection." The direct contrary is the

* I heard it stated that "Scalpel" had committed an error in this paper in the number of horses power required for the air pump. I take this opportunity of correcting it. Instead of 46, it should be 20. On data being given, it was so evident that it was a mistake of figures, not of principles, that I considered it needless to trouble you for an insertion. I omitted to halve the strokes of the air pump.

fact. I must also protest against the singular assertion, that, "Mr. Watt laid aside condensation by surface in favour of injection, not from any excellence inherent in that principle, but from the thickness of metal of which the globe is composed." Why not then try their metal? would occur to the least inquiring mind. Can we conceive it possible that Mr. Watt should continue attempts so unphilosophical that a tyro would be ashamed to adopt; or that he would lay aside a system because, with means he must have known were inadequate, he found the result so unsatisfactory. Even were it not well established that Mr. Watt had used thin copper tubular condensers, it would savour more of a proper appreciation of his judgment to infer that the same process of mind which had invented separate condensation, and those experiments which had correctly proportioned the injection matter to effect it, would have led to the proper application of the same quantity of cold by surface. Satisfied, as all acquainted with the steam-engine must be, of the superiority of surface condensation, *per se*, but that its preponderating drawbacks prevent its general application, we can only reasonably conceive that Mr. Watt was equally well informed on the subject as ourselves, and had tried every means which his great talents would suggest to remove them, but that he relinquished this system because he found, taking all things into consideration, the superior "excellence inherent in injection," namely, its cheapness in first cost, the little expense of keeping in repair, and little liability to derangement compared with the thousands of joints of surface, its perfect simplicity, its precision, and instantaneous action. To assert otherwise is but a gratuitous assumption unsupported by authority or reason; for, however little may be the reliance placed by some on the speculations of philosophical induction, in the absence of facts to the contrary, it is the only sure light, and one, properly used, of far spreading rays to guide us in our researches into the past, and we shall at least err on the just and least doubtful side, when our inferences render consistent and harmonious the characteristic excellence of the genius of the dead. No writer, who voluntarily takes upon himself to instruct the public, should approach so sacred a deposit as the fame of great men, without a minute acquaintance with their works, and a complete knowledge of the strength and peculiar property of their minds. Then should we no longer see dancing, like motes in the sun-beams, those thousand and one floating assumptions to their prejudice, which being investigated "like the baseless fabric of a vision, leaves not a wreck behind." But in an age of a forced and fleeting literature, the wants of the passing hour are unfortunately supplied at the expense of accuracy, and the fabled labours of Hercules would be an easy task compared with that of rectifying the many evils it is producing. But to return to the chief object of this postcript. After noticing, without the praise it deserves, Howard's plan of condensation, and referring to Symington's as "not yet having been made public," though three years ago it was publicly applied to the *Londonderry*, the writer concludes with these words, aiming, apparently, a fatal blow at condensation by injection,—"There is one point connected with the principle of condensing the steam by an injection of purified water, which strikes us as not having been as yet fully considered, which is that the water resulting from the condensation of the steam would be altogether insufficient in quantity to effect that object; and therefore it appears to us that the supply of the condensing jet must, sooner or later, have to depend upon the quantity of pure water with which the condensing cistern was originally supplied. *It can hardly be contended that a cubic inch of water would be sufficient for the condensation of a cubic foot of steam, and also to supply the waste of evaporation, leakage, &c.*" And here this objection, if fatal, would apply with still more reason to Symington's plan, because there is no condensing cistern attached to it; nothing but the mere pipes which lead from the hot-well and terminate in the usual condenser. Yet being full at starting, is the simpler answer. The quantity can never be diminished so long as the engine is at work, the steam from the boiler, when condensed, keeping up the exact proportion required, because the pipes can only be full, the rest supplying the boiler in the usual way. It it for such reasons as these that I prefer this plan. Once the pipes are properly applied the plan requires no further looking to. Though the chances of "leakage" in pipes that can be fused into lengths, almost jointless, are compared with surfaces, as units to thousands; yet, if leaky, the lighter distilled water, flowing to a vacuum, would be prevented escaping by the denser sea water, and as every stroke would continue the proper quantity in the pipes, (just as much as they could hold,) but little external water could find admission, not sufficient in a month's constant work to encrust the boilers. But with surface, no sooner would the joints leak (and can the writer in the *United Service Journal* suppose there is no liability to "leakage" in fourteen thousand,) those not being filled, the external water would rush into the vacuum at every stroke.

31st October, 1840.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for August, 1840.]

Carriage Brake, *C. Walker*, *July* 8. This brake is to operate by forcing a friction bar against the hind wheels of a carriage, the foot of the driver being placed upon a treadle for that purpose. The affair does not present a large amount of novelty, but it differs from other brakes in the particular arrangement of the rods and levers, and this constitutes what is claimed.

Cutting Shingles, &c., *J. Burt and E. Smith*, *July* 9, 1839. The claim is to "the manner in which we have constructed and combined the parts by which the stuff to be cut is fed up to the knife, and canted so as to produce shingles of the proper slope;" which method is particularized, but is much too complex for verbal description. It is managed with much ingenuity, and will probably operate well. The shingles, &c., are to be cut from steamed timber.

Elliptical Steel Carriage Springs, *F. Hatch and J. W. Terry*, *July* 10, 1839. Two bow springs are jointed together at their ends, so as to form the ordinary (so called) elliptical spring, and within these two, other bow springs are placed, with their convex sides towards each other; these are joined together at their middles, whilst their ends bear against the interior of the first-named springs.

"What we claim as our invention, and desire to secure by letters patent, is the addition of two leaves to the inside of the elliptic spring, with the curves reversed, in the manner herein described."

Planing Machine, *F. Walcott*, *July* 16, 1839. This planing machine is in its general mode of operation like that of the late Mr. Woodworth, but the cutters are double ironed, and the claim is to "the combination of the double iron rotary plane with the throat, or mouth-piece, constructed and operating as described."

Clearing Railroad Tracks from Ice, &c., *J. N. Dennison and E. Kirkpatrick*, *July* 29, 1839. The plan for clearing off ice and snow from rails, consists in affixing scrapers and revolving brushes on the fore end of a locomotive. The scrapers are to be placed obliquely, so as to throw the ice or snow outwards, and they are fixed in spring bearings, so as to admit of their yielding when necessary. The brushes are made to revolve just back of the scrapers, and are intended to remove the snow or ice left by the scrapers. The claim is to this arrangement, which we apprehend will, in most cases, be so inefficient as to cause it soon to go out of, if ever it has been in, use.

Anti-friction Apparatus, *J. G. Tibbets*, *July* 22, 1839. This is said to be "a new and useful mode of applying rollers around axles, and balls at the ends and shoulders thereof, for reducing friction." The patentee says that he does not claim "the employment of rollers and balls to avoid friction in machinery, but what I do claim is the combination of the two sets of concave flanches with the balls working between them, to prevent the balls from rubbing against the axle and box, in the manner, and for the purpose set forth; and also the reducing the diameter of the rollers at the middle, to form a space for oil."

When we hear, satisfactorily, of the benefits derived from this apparatus, we will give to our readers the matter entire, with all its illustrations. We are very apprehensive, however, that the day is far distant when we shall be called upon to redeem this promise.

Obtaining the Rectangle of any Irregular Figure, *T. Wood*, *July* 22, 1839. The claim under this patent is to "the application of the principle, that 'solids introduced into fluids displace a quantity equal to their bulk,' to the mensuration of superficies by means of mercury and glass plates, as described." And the patentee says, "the nature of my invention consists in cutting paper to a corresponding form and dimensions with an accurate plot of the superficies to be measured, and introducing it into a stratum of mercury between glass plates."

The mode pointed out of obtaining the rectangle of an irregular figure is about as useful and as accurate as some *mechanical* modes which have been proposed for obtaining the quadrature of the circle. It goes upon the principle, that by ascertaining the quantity of mercury displaced by a rectangular piece of paper, similar to that from which the form of the plot is cut, the quantity displaced by the latter will give the elements of its rectangle, however irregular its outline may be. Who will buy a right?

Metallic Hubs for Carriages, *G. Hunt*, *July* 8, 1839. The claim under this patent is to "the mode of securing the pipe-box of the hub to the arm of the axletree, by means of a band attached to the flanch of the axletree, embracing the flanch on the pipe-box as described."

On the inner end of the box there is a projecting flanch or rim, which comes nearly into contact with the shoulder, on the head of the axle. The band mentioned in the claim is fastened to the head of the axle by a screw bolt; and a flanch, or fillet, on the interior of this band, embraces the shoulder on the box, and holds it in place, leaving it free to revolve.

Padlocks, and Locks of other kinds, *J. Nock*, *July* 16, 1839. The objects professed to be attained in the construction of these locks, are to secure them from the dan-

ger of being opened by a false key, and also of being opened by a blow, given either by accident or design, by which the bolt or catch of an ordinary padlock is frequently started, and the lock opened.

There is to be a notch on each side of the bow of a padlock, to which are adapted two catches on what is called an escapement tumbler, and when this tumbler is acted upon by the key, it must be carried to an exact point to allow the bow to be liberated, as otherwise it will be held by one or other of the catches. In other locks the same device may be used, by arranging the parts so as to adapt them to the particular kind to which they are applied. These padlocks are now employed on some of the United States mail routes, and are to be adopted for the whole as soon as the supply is sufficient.

HAMMERS AND HATCHETS, *P. Eastman, July* 17.- The eye of the hammer, or hatchet, is to be oval at one end, and round at the other, the round side being that at which the handle is to enter. This hole or eye is to be tapped in the round part, to receive an iron socket, which is to be screwed into it, and to pass through sufficiently far to occupy a portion of the oval part of the eye; an oval punch is then to be driven in at this end so as to open the socket to the eye, and prevent its turning. After this, a wooden handle is to be passed through the socket, and wedged in the ordinary way, to open it to the oval of the end of the eye.

The claim is to the "making the socket with a screw on the outside thereof, to screw into the aperture or female screw for the same, and extending it into the oval part of the aperture in the hammer a short distance, where it is made to assume a corresponding oval shape, by punching or otherwise, to prevent turning or drawing."

DRILLING IRON, BRASS, &c., *J. H. Currier and W. H. Taber, July* 8, 1839. A mandrel carrying the drill, works in collars within which it can slide back and forth horizontally. A lever of the first kind is attached to an upright rising from the bore of the machine, the lower end of which is received between two collars on the mandrel, so that by the motion of the lever the mandrel may be moved in either direction. A screw passes through the upper end of the lever, and is tapped into the upright, but not into the lever, within which it turns freely, having a shoulder that bears against it. There is a hand wheel on the head of this screw, by which it may be turned, and a winch on the back end of the mandrel, by which it also may be made to revolve. This constitutes the whole machine, which may be affixed to a bench or held in a vice.

The claim is to "the method of forcing in and drawing out the drill stock, lever, and screw, in the manner described." There is, we suppose, sufficient novelty in this arrangement, but we do not think the plan an improvement on several other machines which we have seen in operation.

LAMPS FOR BURNING SPIRITS, *J. S. Tough, July* 17, 1839. "This improvement consists in raising the horizontal plate at the mouth of the shade for increasing or diminishing the draft, by means of a metallic frame or screw, instead of raising or lowering the shade or wick," and the claim is to this, and to the particular manner in which it is effected.

NOTES AND NOTICES.

Development of Odours.—Every one is acquainted with the rotation which a piece of camphor undergoes in water, and the explanation of the fact which usually ascribes it to the disengagement of the odorant vapours which exhale from it. It is known also that the leaves of the *schinus molle* placed on water, forcibly retract when the surface of the water is covered by a layer of odoriferous oil. M. Morren has just observed a similar phenomenon produced by the volatile oil secreted by the down of the *passiflora fœtida*. When some of the down or hair is placed under water, a small drop of green oil detaches from it, and swims on the water. This drop expands, contracts, expands, contracts again, then seems to burst with force, but the fragments unite to expand again a moment after, and thus the action goes on for about ten minutes, after which the oil is by degrees concentrated, and becomes motionless. These facts may serve, perhaps, to point out a physical theory of odours.—*Jour. de Pharm.*

Durability of Leather.—Visitors to the Hospital of St. Cross, near Winchester, are shown in the hall two leather stoups or black-jacks for ale, which are, upon pretty good authority, stated to be three hundred years old. Perhaps a more striking proof could hardly be advanced that there really is, for durability, "*nothing like leather!*"

Tuck's Hermetic Envelopes.—An ingenious plan has lately been adopted, by which the penny postage labels may be used as wafers to letters. The difficulty that formerly existed in doing this, consisted in the fact that if the address was on one side of the letter and the label on the other, the latter was apt to be overlooked at the Post-office, and the letter charged double postage. This difficulty is now obviated by the new plan referred to, as the address is written on the same side as the seal, thus securing that both will be attended to by the Post-office functionaries.—*Examiner.*

Cloth Manufacture, Booth's process.—Sir,—In the Freemason's Magazine, for March, 1797, the death of Mr. Samuel Booth, of Cumberland Gardens, Vauxhall, was announced—stating that he was the inventor of the polygraphic art and of the more important *art of manufacturing cloth by a perfectly original process.* I shall feel obliged if any of your readers can inform me what was the process performed by Mr. Booth for manufacturing cloth.

October 15, 1840. C. C. C. C.

A Steam Fire-engine has been invented at New York, by Captain Erichsen. It weighs only 2¼ tons, and will throw 3,000 pounds of water per minute to a height of 105 feet, through a nozzle of 1¼ inch diameter.—*Times.*

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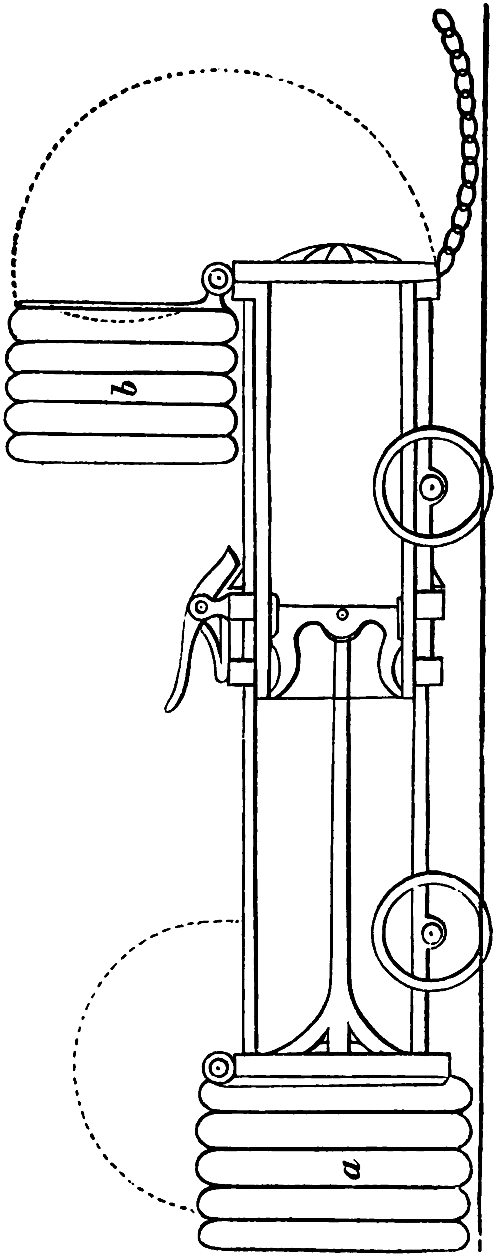


SIR GEORGE CAYLEY'S GENERAL BUFFER FOR EACH END OF RAILWAY TRAINS.

ESSAY ON THE MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES.

BY SIR GEORGE CAYLEY, BART.

The enormous advantage of railway communication is now fully appreciated by all classes of society; and even the chariot and four is laid aside, or, disengaged from its proud steeds, hoisted on the sturdy back of its rival, to grace the more plebeian vehicle by the fascinating halo of its coronet. Our delight in railway speed is unfortunately chilled by the accompanying drawback of its danger. Within the last three months many serious accidents destructive of life, under very awful circumstances have occurred; and though on comparing the millions of persons who have availed themselves of the benefit of railroad travelling without injury, with the few that have suffered, there is reason to believe that a greater per centage of fatal accidents prevails, mile for mile, in carriages drawn by horses; yet as it is now evident that the former will eventually extinguish the use of horses except for local purposes, it becomes the duty of the legislature to apply the best means in its power to insure safety of life and limb to her Majesty's liege subjects of all ranks; and not to leave them exposed merely to such measures of care, as the directors or agents of railroads may choose, when enjoying, danger or no, a complete monopoly of the public means of conveyance. No doubt, were railroads to be constructed now, with all the knowledge gained from the experience of the past, much additional safety might be attained. Supposing, for instance, that instead of making the wheels, as at present, sink about an inch and a half by the side of the rails on which they run, they had three inches of hold before they could be lifted out, many small substances that would now throw them off would not have that power; and probably the cases of accident from that source would be diminished one-half. Many other similar improvements experience must have pointed out; and it would be very useful to draw all this experience to a focus by a parliamentary committee of enquiry, not only as respects the construction of the machinery of railroads, but as to the best code of precautionary measures of management;—the sufficiency, as to the numbers and quality of officers—the arrangement of signals—and all the various manipulations required to give the greatest possible safety in combination with the required velocity of the trains. Such a committee might go still further, and by calling upon our first-rate engineers, and other scientific persons, to suggest such improvements as they think attainable, much expedite the ordinary progress of this new art to maturity. With a view to stimulate the legislature to go into this enquiry, it may be well to consider some of the leading points of danger, and to suggest such means of counteraction as may be most obviously applicable to each case;—more in the expectation that these or similar means may be matured by the proper authorities in mechanical science, than as worthy of application in the crude state in which they are thus pointed out.

It is obvious that the danger of being conveyed with great velocity, arises from the possibility of that velocity being too suddenly stopped; and before we can judge of the efficacy of a remedy for this evil, it is necessary to have a knowledge of the degree in which it prevails.

Twenty miles per hour, including stops—say twenty-one actual velocity—is about an average speed on most railroads. Were this suddenly stopped, as against the abutment of a bridge, &c., the blow would be equivalent (without buffers and cushions) to falling from a height of sixteen feet upon deal boards,—if happily they escape a more severe contusion from some protruding point, as the elbow of the opposite seat, or the scull of their vis-à-vis. This danger has a tolerable parallel in what might be expected, should the drawing-room floor give way, and precipitate its inmates on to that of the dining-room beneath. It is not necessary to add to our dislike of such a catastrophe, but yet it is useful to have a true measure of the degree of danger from this source; and it is sufficient to state the fact, that double the speed named, or forty-two miles per hour, is frequently attained in descending inclined portions of the way. In this case the blow would be equal to that received in falling from a height of about

sixty-four feet. This is falling from the chimney top to the cellar—an experiment not to be tried twice in one man's life time.

To meet this danger, every railroad carriage is provided with two buffers at each end of its frame; these are formed of leather caps well stuffed, and fixed on an iron shank, which presses on strong springs placed under the frame for that purpose. These springs can, when great force is applied, recede about a foot before the buffer can be pressed home to the frame. This is a very admirable contrivance, and perhaps the best that can be applied in each carriage separately. Suppose it may require a force of four tons to press home the two buffers, and that each loaded carriage be two tons weight, the power of resistance in the two buffers will be equal to what they would restore in their recoil, which would be equivalent to raising four tons half the length of the action of the spring, or six inches, and equal to two tons raised one foot. But the velocity of twenty-one miles per hour in the carriage is sufficient, if so applied, to raise its weight of two tons, sixteen feet; hence the buffers would only absorb an eighth part of the shock in the first carriage. This is, of course, but a rude approximation to the truth, through the means of an hypothetical case; but it may aid our ideas in seeking a remedy, and it points out that although the buffer cannot be dispensed with, yet that it does not carry out the principle of an elastic retarder to a sufficient extent.

It is obvious that to take full advantage of this principle, there should be in advance of the engine, and in the rear of the last carriage in every train, a separate vehicle devoted to carrying a buffer of sufficient power to save the whole train and its engine.

The first idea that naturally presents itself, and has probably done so to many, is that of making a series of mattresses, of some elastic matter, to be so packed on the frame of a carriage (say for twenty feet in length) as to be able to be compressed to any extent on meeting resistance; and I am by no means certain that any other contrivance will do much better; but in these engineering days we shall never be contented without some more precise and workmanlike method, and luckily the elasticity of air when compressed by a piston offers a ready means for effecting this purpose with such precision as to be subject to exact calculation, and of course capable of being adapted to the power required. The piston in this case possesses the advantage not only of receiving the accumulating resistance of the compressed air in front of it, but also the retardation, if worked through a stuffing box, occasioned by forming a vacuum behind it, which greatly increases its power.

An idea of such a general buffer is given in the accompanying sketch fig. 1. The condensation only of the atmospheric air at its usual density is provided for in this construction, for the purpose of making the sketch less complicated; but if the now open top of the cylinder be supposed to have a cover, with a stuffing box in it for the piston rod (when properly adapted to that purpose) to pass through it, both these powers of retardation might be used. When sufficient power for the trains, can be obtained by condensation only, it will be well to make use of the instrument in that way, because it is then more secure in cases of extreme violence from being so injured as not to be able to perform its functions.

Suppose the air cylinder to be six feet in diameter, and the piston to be able to condense the whole charge of air into one-twelfth part of its original bulk, when it has been pushed in ten feet; the power of retardation commencing at zero, and being at the termination about 165 lbs. per square inch, may, including friction, be taken at about 35 lbs. per square inch on the average for the ten feet of stroke; which, on this area of 4071 square inches, amounts to about 63 tons. Hence the whole power of the retardation may be taken as equal to lifting 63 tons ten feet.

The velocity of the ordinary trains, as has before been shown, is equal to lifting their weight to the height of 16 feet, and hence it requires about one ton and six-tenths of retardation for 10 feet, to balance one ton of the train for 16 feet; consequently this general buffer will be equivalent to about 39 tons of the train. This, however, will be sufficient; take the buffer itself at 8 tons, the engine at 12, and the first 9 carriages at 18, making 38 tons in all.

If placing the stuffing box on a sliding plate in the cover be sufficient to obviate the danger of the piston rod not working freely, if slightly deranged by violence, the buffer may he made of considerably smaller size, and of course more light and convenient. By leaving in this case any required portion of air behind the piston, the power of retardation from the vacuum would not commence abruptly, and may thus be regulated also in its intensity. The cylinder must be furnished with a valve or stopcock under command at the end to permit the escape of air whenever it is required to run the wheels nearer together, so as to place them on the turning platforms; and the frame connected with the piston, and which runs freely in a sheath external to the cylinder, both above and below it, is held by a spring catch in its place till some object requiring the action of the buffer be struck.

This buffer is also furnished with stuffed pads at each end, *a b*, to take off the first shock of the *vis inertiæ* of the piston, its frame and wheels, which are necessarily ponderous to be of sufficient strength. These pads turn upon hinges, so as to shorten the length of the carriage when required, as may be seen in the sketch, where the hind one *b* is turned up.

October 6, 1840.

(To be continued.)

ON THE COMPARATIVE MERITS OF PADDLE WHEELS AND SCREW PROPELLERS — REPLY BY MR. HOLEBROOK TO MR. PHILLIPS.

Sir,—I trust I may be permitted to trespass upon your pages with the following remarks, in reply to a paper entitled "Screw propellers superior to paddle-wheels, inserted in your last No. (898), and communicated to you by its author, Mr. Roger Phillips. It is not my intention to combat the dogmatical (I use this word in no offensive sense,) assertions of this gentleman in the way in which they might be, in order to disprove them, because I consider a mere re-reading, of my article in your 892nd and 893rd numbers, to be all that is necessary to confute them, supported, as my observations were, by proof after proof deduced from mechanical scientific works and facts; but I purpose merely to confine myself to strengthening a little the position I maintained, and to removing the erroneous impressions which might be made by Mr. Phillips's remarks, upon some of your readers, who would scarcely imagine that gentleman had so very inattentively read my article, as I shall show he could only have done when he penned his remarks.

Mr. Phillips's diagram itself goes only to establish that which nobody disputes, namely,—merely a propelling power for the screw; and against his mode of estimating the resistance, arising from the inertia of the water, I have nothing to urge: but the point, upon which I differ with him, is his deduction, that "the *whole* power therefore theoretically, would be directly exerted to move any floating body to which the screw might be attached in the direction A. B." According to the hypothesis of Mr. Phillips, which flies in the face of the most palpable results, the useful effect would be exactly and directly proportional to the power employed in making the screw rotate, which I shall show to be utterly impossible. If this hypothesis were just, and it is upon the correctness of it that nearly all Mr. Phillips's conclusions depend, any difference of inclination, of the thread of a screw, from the direction of its axis, might be entirely disregarded, except as to increase or decrease of the amount of resistance. If Mr. P. were right, the greater the amount of the resistance, the greater must be the useful effect. Now the case, in which the resistance would be greatest to the rotation of a screw would be that, in which the thread of the screw made the smallest possible angle with its axis, or, in other words, that case, in which the thread and axis approached in direction to the nearest possible similarity, that the nature of the mechanical instrument, the screw, would allow. To this case, a screw would be represented, for all useful effect in propelling, by a common-paddle wheel placed at the stern of a vessel with the shaft parallel in direction with the keel. In such a case, I ask, would not the resistance be palpably the greatest, and yet what would be the useful effect in propelling the vessel forward? Why, in the case of the paddle-wheel thus placed, positively nothing: and in the case of a screw, such as I have

just supposed, this effect would be as near to nothing as possible. This I think may be sufficient to demonstrate very palpably the inaccuracy of considering the *resistance* as an indicator of the *useful effect*. But, further, were the hypothesis of Mr. Phillips just, then the resistance, being all exerted in propelling the vessel forward, there should be no power tending to propel the vessel sideways, or in a direction contrary to the rotation of the screw; because we could not have the *total* power effective in propelling the vessel forward, and another portion of power, *more than* the *total* power, tending to give motion laterally to the vessel; whereas, if I can show that a portion of power *is* consumed in having a tendency to give motion to the vessel laterally, I think I shall prove that *all* the power cannot be employed in propelling the vessel forward; and, I imagine, I shall have no difficulty in substantiating my position by the case I shall now suppose: Let us imagine a vessel to be fitted with two screws, such as that of the *Archimedes*, these being placed in the positions of the common wheels of a vessel. Now, upon the proper rotation of such screws, I ask, would not the vessel move forward? I think no one will deny that it would; and, yet, if Mr. Phillips's hypothesis of the power being entirely exerted in a direction parellel to the axis of the screw, were correct, the vessel would not be at all moved, because the screw, on one side of the vessel, counteracting the screw on the other side, the power employed to make such screws rotate, would be merely consumed in agitating the water. But this could not be the case, as may be imagined from the effects which would be produced by such a wheel as that of Mr. Samuel Hall alluded to by me at page 302 of No. 893 of the Magazine. Indeed there was a wheel upon this principle lately exhibited at the Polytechnic Institution, and may be probably again when that institution re-opens. Mr. Phillips will not, I am sure, contend that a screw will have the magical property of exerting its force *wholly* in the direction of its axis when it is placed at the stern of a vessel, and, upon the mere placing of it at the side of a vessel, will exert its power *partly* in a direction at *right angles* to its axis; and yet if the screw does not possess this property, what becomes of the theory of Mr. Phillips? Why, it is entirely without foundation.

But if, throwing overboard this gentleman's hypothesis, we assume, according to the well known law of hydrostatics, that the resistance, to the passage of an inclined plane or screw, is given in lines perpendicular to the surface of the plane or parts of the screw, then we have no anomalous and contradictory results; there is then no opposition of appearances and effects to what theory would give; but, on the contrary, there is no other variation of effect, than that which unavoidably always occurs between practice and theory. The laws of which I availed myself in my article, it is unnecessary to state, were not of my making, I have done nothing more than make an application of them, and if I have erred in this application, I am, of course, open to correction.

Mr. Phillips says, "So far from cutting away the inner parts of the screw, the only question seems to me to be *how far are the outer parts necessary?*" Were his hypothesis correct, he would be perfectly justified in his opinion, because he would unquestionably obtain a greater proportional resistance from the inner, than from the outer, parts of the screw; but his opinion, of the resistance and useful effect being equivalent the one to the other, being, as I have shown, entirely untenable, the observation I have just quoted falls to the ground.

With respect to Mr. Phillips's observation about my taxing Captain Chappell with error upon the angle of the screw, I must refer your readers to what I said upon this subject in my communication; from which it will be seen that I was unavoidably obliged to notice what appeared to me to be incorrect; and I can only now say that persons generally would have assumed the angle meant to have been that of the circumferential parts of the screw; but it appears that Captain Chappell meant the angle which was made by the *mean part* of the screw, and not by its *extremity*. Now, if by the *mean part* of the screw, the part midway between the axis and the extremity be meant, even then it appears the angle of 45° is not correct, inasmuch as the angle made at that part is about 48½°; or if the mean angle between the angle at the circumferential

parts and that at the axis be meant, then, as 66° is the angle at the circumferential parts, and 0° that at the axis, the mean found, by dividing the sum of 66° and 0° by 2, as the number of positions, the angle should be 33°, and not 45°. My opinion, if I may be allowed to differ from Mr. Phillips, by supposing that he does not speak Captain Chappell's opinion, which I have no right to assume he does, is that Captain Chappell, in stating the angle at 45°, took that angle to be the proper one, from the general appearance of the screw, in which he might be correct enough; for it appears to me very easy to mistake the real angle of a screw of the kind of the propeller, from some properties peculiar to it, when viewed without measuring it. The remarks I made in my communication upon the angle were, I beg it to be understood, quite incidental, and in order to avoid appearing wrong myself in one part.

Mr. Phillips alludes to my having "theorized myself into sad confusion upon the subject of *slip*," and he goes on to attribute to me what he calls the absurd hypothesis, that the slip in the case of the screw is equivalent to the loss of power. Now I must tell Mr. P. that the confusion and the hypothesis are entirely his own, and not mine. I am not aware that *I* have so confounded the slip and loss of power, but I will quote a few of the words I used. I said, "Some observations which I wish to make on the slip, or, *as it is called in this pamphlet*, the loss of power of the screw, will not here be misplaced." By reading the words I have now underlined with proper emphasis, my meaning will not be so confused as Mr. Phillips thinks. The whole tenor of my observations, whether upon the screw generally or upon the *slip*, does not at all show that *I* could have considered the *slip* as synonymous with the *loss of power*; though it does seem, from Captain Chappell's report, and from the communication of Mr. Phillips, that both Captain C. and Mr. P. entertain something bordering as nearly as possible upon the opinion that the slip and loss of power are one and the same. The *slip*, as every investigator of propelling instruments knows, does not represent the loss of power attendant upon the use of any particular instrument, as loss on this score must wait upon the most possibly perfect propelling machine which acts by the resistance of the water.

I do not see any reason to repent of my mode of estimating the slip of the screw; because, though it is quite true (supposing the vessel to go at the rate of 8.8 nautical miles per hour, while the screw could only, if it worked in a solid, propel it at the rate of 10.9 nautical miles per hour,) that the slip may thus be less than one-fifth; yet, on the other hand, when it is considered that, in order to accomplish an advance equal to the length of its axis, or of 8 feet, even if working in a solid, the circumferential parts have to pass through a space equal to more than 18 feet. I think there is sufficient reason for estimating the slip of the screw according to the plan I pursued, and, therefore, at an enormously greater amount than Captain C. or Mr. P. does; for we might as well assume that a man, who chose to pursue a circuitous route towards an object, instead of a direct one, passed over no ground uselessly, as calculate the slip of the screw as Mr. Phillips and others have done.

I now come to that part of Mr. Phillips's communication in which he says that "Mr. Holebrook cannot discover how the action of the screw should alter the position of the ship's head some points previous to her getting way, a fact attested by several respectable and disinterested witnesses." Now it is very remarkable that I not only did not say what is imputed to me, but that I said exactly the reverse. I now quote the words I used, which were these: "With respest to what is stated under the head of Steerage I would observe, that it is very easy to understand how the screw-propeller facilitates the turning of the vessel." From what I have here quoted it will appear, that far from denying the evidence of the respectable witnesses alluded to by Mr. Phillips, I attributed the same property to the screw, in the respect of turning the vessel round, that these witnesses, as well as Captain Chappell and Mr. Phillips, give to it. Mr. Phillips must have read my observations upon this part of the subject very inattentively indeed, to have attributed to me the reverse of the opinions I entertained and stated. With respect to my different method of ex-

plaining the cause, until I see some better reason than any which Mr. Phillips gives in his communication for correcting it, I must take the liberty of maintaining the opinions I stated in my article. Further, had this gentleman carefully read and considered my communication, he would not besides have observed, that "if Mr. Holebrook's theory were correct, the fluid would never be driven near the rudder by the action of the screw, much less forced thus violently against it;" Mr. Phillips would, on the contrary, have perceived, from my statement, that I said, that, "the water is not really thrown off in radii, though it may appear to be so; but is thrown off in perpendiculars from the surface of every part of the screw;" and from this, my theory, he would have seen, that some of these perpendiculars must necessarily impinge upon both sides of the rudder.

(To be concluded in our next.)

PADDLE-WHEELS *v.* SCREWS.

Sir,—The *Archimedes* discussion respecting the relative efficiency of the screw and the paddle for propulsion, resolves itself into the theory of the locomotion of birds and fishes. It must be acknowledged that this theory is at present very imperfect, or rather, that nothing satisfactory on the subject has yet been published. It is well known that the propelling power of fishes resides in the tail, or properly speaking, in the whole posterior portion of the fish, and that the muscular force producing it is far greater than any human ingenuity can compress into the same weight and space, as there are reasons to believe that the velocity of fishes, in some instances, is not much less than that of the swiftest birds. It is, however, not so obvious, how the action of wings can produce such power of locomotion through so rare a fluid as the air, but in both cases we see sufficiently that such locomotion is produced by a series of impulses. Now no successive impulses can be given without recovering, between each, the position of making a fresh one, and such backward motion must be accomplished, *in the same fluid,* with great rapidity and with very little friction or counteraction. The mode by which this "feathering of the oar" is effected through water, without a corresponding retardation, is a problem which mechanical *man* has not yet been able practically to solve in any degree approaching the success of birds and fishes in doing it, and that without the use of any spiral movement; for nature, amidst all her variety, has not in a single instance, I believe, made any animal to screw itself along. Who then, employing his unprejudiced reasoning faculties in the particular case of a body floating on the *surface* of water, would not take advantage of the denser medium to make the propelling stroke, and avail himself of the power of making the next through the rarer one of the air?

That vessels fitted up on the plan of the *Archimedes* will be very useful in commerce by the use of steam as an auxiliary to sails, I am fully prepared to admit, and therefore, that Mr. Smith's is a very valuable invention—with this he ought to be content without seeking to substitute it in all cases, for I think nothing is more clear than that, with equal power in similar circumstances, no contrivance whatever *totally immersed in water* can compete with the common paddle-wheel, or with any other propulsive power, which recovers its stroke through the air.

H. A. M.

THE DIFFERENT SYSTEMS OF CONDENSATION.

Sir,—I have hitherto thought proper to be a silent observer of the many remarks in your journal on my system of condensation by re-injection, but a sense of duty to myself causes me to write, and I trust will induce you to insert the present communication.

But first I will notice a statement of a correspondent in your last Number, that he witnessed this plan in operation (Mr. Symington's arrangement) on board the *Dragon* tug boat for two hours alternately with the ordinary plan, during a day, and that a saving of one-fourth of the fuel was effected by it. Allow me boldly to *assert*, that either your correspondent has been most shamefully imposed upon, or that he himself is attempting to impose upon others, and

that no such advantage can be obtained by *any* plan of condensation, my own of course included, over the common one in such time or manner; and I for one should be ashamed to practise or hope to benefit by the practice of such deception.

Now as to the claim of Mr. Symington (allow me to reiterate) to the method by continual re-injection of the same water gradually cooling it by surface exposed to external cold water, and not confining the claim to the mere position of that surface, I have said my say in your journal long since. Your intellegent correspondent, "Scalpel" has alluded to the *City of Londonderry*, and to the failure of the plan as tried (and *thus* it must needs have failed) in that vessel by Mr. Symington. On this I have to observe, that I applied to the company (the Peninsular) owning that vessel on their infringement of my patent, and should have had recourse to legal means had they not abandoned it, and in such manner I shall again act if needful—else what's the use of a patent? Besides, the patent of Mr. Symington was taken out for another invention, and thus I was deprived of the opportunity of opposing it in an earlier stage had I thought proper; a *laisance* that the patent law justly punishes more severely than any other.

And now I call upon Mr. Hall honourably to correct *his* publications of an *official* document, viz.: the Report of Messrs. Lloyd and Kingston to the Admiralty on his plan of condensation. He has made an omission that caused me some surprise at the time, (for I have the highest opinion of the honour and impartiality of these gentleman,) but which, so far as regards them, was removed by my accidentally seeing a true copy of the report about two years ago. I have hitherto deemed this beneath my notice, and had indeed forgotten it, but have now been reminded of it by an article from a correspondent in one of your late numbers, and therefore it has become rather a public than a private matter.

Mr. Fox has made a curious estimate of the action of the two plans of condensation (let us call them "by refrigeration," and "by re-injection,") in regarding it as merely the cooling of so much hot water. Where, Mr. Fox, are you to put the *latent* heat of the steam? and that too to be got rid off in *an instant* through metal generally coated with grease. (Let the shade of Watt answer, where!)

For the present I will conclude by stating, that it was the want of full success on trying the method by refrigeration that led me originally to invent and carry into effect the process by re-injection; for the continued use of the same liquid, with a good vacuum, was essential to my plan of vaporization, which latter I should add (unlike the process of condensation) has proved defective in some practical points, after many attempts on the great scale more or less successful. Further, none of your correspondents having as yet given a full exposition of the action of the method of condensation by re-injection and of its advantages, you will allow me an opportunity, having had no little practice on the subject, of doing so, if in the mean time it be not better done by other hands.*

I am, Sir,

Your most obedient servant,

THOMAS HOWARD.

King and Queen Iron Works, Rotherhithe,
Nov. 10, 1840.

MR. SYMINGTON IN EXPLANATION OF HIS METHOD OF CONDENSATION.

Sir,—When the Fox preaches let the geese beware. In reply to Mr. Fox's challenging letter in your 898th Number, I have merely to observe, that as one well-established fact is worth a thousand assertions, I can produce three which will test the value of his opinions and rather spoil his sermon.

Mr. Fox says, "that he has no hesitation in asserting that the doing of that which I propose is totally impossible," while Mr. Hall on the contrary, has effected all that could be desired. In this with all the zeal, and with but little of the discretion of a friend to Mr. Hall, he attempts to claim more for that gentleman to the disparagement of his competitors, than he will find it easy to maintain.

Having no wish to say a single word

* We shall be glad to hear again from Mr. Howard on these points.—ED. M. M.

against Mr. Hall's invention, I will not allow myself to be dragged into any controversy on the merits of our respective inventions, nor tie myself to the use of pipes of 7, 4, or 3 inches diameter; but I shall content myself by stating what has actually been done with my method of condensation as the best proof that it is valuable, and requires only to be more generally known to come into universal use.

Three vessels have been fitted with the Symington plan of condensation, the *City of Londonderry*, the *Dragon*, and the *Fletchers Dispatch*. The *City of Londonderry*, the first vessel to which the apparatus was applied, was fitted with rather a scarcity of cooling surface, which I have never attempted to conceal, but have always publicly avowed, as Mr. Fox might have been aware of, if he had been much acquainted with an invention concerning which he asserts so much and proves so little. But even under such circumstances what were her performances? She performed three successive voyages to and from Gibraltar, using the apparatus out and home, during which the boilers were kept perfectly clean, and the consumption of fuel diminished from 18 cwt. to 1 ton per hour to 13 or 14 cwt. When the apparatus was removed, the *Londonderry* was not so successful. The usual consumption of fuel took place, her boilers again became salted, and she was so unable to keep her time, which she had always been able to do with my apparatus, that she was dismissed the service. A better instance of the value of the invention could not have been afforded than its application to the *City of Londonderry*, as I am able to substantiate should there ever be a necessity for so doing.

The *Dragon* was the next vessel fitted. Her boilers have been in use for nearly three years, with the apparatus, and the consequences have been that a saving of one-third of fuel has been effected, and the boilers kept perfectly clean.

The *Fletchers Dispatch*, has, in one of the most muddy rivers in England, the Humber, run for a year with clean boilers, and a saving also of one-third of fuel.

Mr. Fox thinks it an impossibility to keep the engine properly at work on my plan for a consecutive hour. He will find that the engines of the *Dragon* and the *Fletchers Dispatch* have been kept at work for several consecutive days, during which time the refrigeration must have been tolerably perfect, notwithstanding Mr. Fox's presumption of there being no distilling apparatus or anything of the kind to afford an additional supply of pure water.

Cooling down steam-engine condensement in a pond or reservoir, and using it again for the purpose of injection, was successfully and publicly practised by my father in Scotland about fifty years ago. And if I have succeeded in doing by my plan that which Mr. Fox acknowledges Mr. Hall, even aided by the ingenuity of so skilful an engineer as Mr. Fox himself could not do, surely he must allow that I am entitled to the same credit that one of Mr. Hall's friends claims for him in your pages, for accomplishing that which had foiled the celebrated James Watt.

In addition to the preceding, I would further observe, ("if you will excuse me for saying so"), that Mr. Fox, with all his information and deep penetration, will scarcely be able to prevent in future, your correspondents from running into errors respecting any plan of condensation; for most assuredly, judging from the specimen he has afforded, there is not an engineer of tolerable understanding who would have ventured with such a scanty stock of knowledge of the subject as he displays to have boasted that, "I am the person who, in answer to some inquiries from the Lords Commissioners of the Admiralty, wrote the letter to Captain Gipps," &c. That I am right in my opinion of Mr. Fox's incompetency for answering such questions, there will be no difficulty in showing from his own assertions.

In comparing the two inventions, Mr. Fox says, "The case is simply this: in a pair of engines of 200 horses power, Mr. Hall, by his method, has only about 13 gallons of water per minute (viz., that which results from the condensation of the steam) to cool by means of metallic surfaces to the degree required not to injure a vacuum; whereas Mr. Symington has, by his proposed plan, to cool nearly 100 times as much."

Again—"Now I presume, that although the refrigeration of 13 gallons of water per minute can be perfectly and

practically effected, it is quite another thing to have to deal in the same time with 1213 gallons per minute."

According to this assertion, it would seem that the condensation of the steam with Mr. Hall's condensers is effected without any cooling power at all, otherwise, whence are the 13 gallons of water procured?

Agreeing with Mr. Fox, "that this is an important matter that must not be overlooked," I shall endeavour to place it in such a light that even he himself may understand it.

In working a pair of engines of 200 horses power, with steam at a given temperature, the quantity of heat to be disposed of to effect condensation by either methods is precisely the same; for the 13 gallons of water, and the steam which produced it, by Mr. Hall's process, contain exactly the same quantity of heat as that of the contrasted 1213 gallons of water to be cooled by my process.

Will Mr. Fox assert that the whole of the steam of the 13 gallons of water said to be cooled down by Mr. Hall's process, is submitted to the cooling influence at once for one minute, or that it is not admitted into his pipes in rapid and successive portions; or will he attempt to deny that the whole of the condensement can be submitted for one minute, or even longer, by my process?

I am of opinion he will be obliged to confess that each successive portion of steam passing through Mr. Hall's apparatus is not allowed even three seconds to pass into the state of water, and bring it down to the necessary temperature.

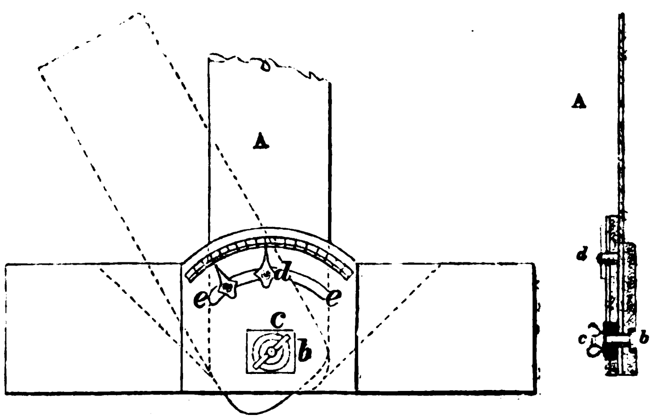
I am, Sir,

Your most obedient Servant,

WM. SYMINGTON.

Wangye House, Essex, Oct. 31st, 1840.

IMPROVED DRAWING SQUARE.



Sir,—The enclosed sketch exhibits an arrangement for the more perfect and expeditious delineation of beveled or angular lines than can, in my opinion, be obtained by that at present in use.

I am aware that some attempts have been made to apply the sector to the ordinary T square; one in particular I remember as being described in one of the vols. of the Transactions of the Society of Arts: a large brass sector was attached to the back part of the stock of the square, and the blade extending back some distance, had on the end of it a pointer, which indicated the angle required. The clumsiness of the mode is sufficiently obvious.

I may perhaps be allowed to say, that

that now submitted to the impartial consideration of your judicious readers, in my opinion, only requires that attention in the fitting up which all mathematical instruments demand, in order to render it a simple yet complete mode of attaining the end proposed.

Though the sketch scarcely requires explanation, yet for simplicity's sake I will say that the blade A swivels on the stud *b*, one end of which is a screw, on which works the thumb-screw *c*, used for tightening or fixing the blade at the given angle. Attached to the blade is another small stud *d*, carrying a pointer as shown. The groove *e e* being cut in the upper part of the stock, it is clear that the stud and pointer is thereby allowed to move with the blade, whether to the right hand or to the left; and there being a brass plate upon the upper surface of the stock, with the various degrees marked upon it, the pointer accurately indicates the angle of inclination of the blade.

I would make just one other comment, and that is, that by having a steel blade, the pointer stud may be fixed with greater ease than in wood, and the mathematical precision of the instrument would be increased.

I am, Sir,
Your most obedient Servant,
T. C.

Manchester, October 24, 1840.

EXTINGUISHING FIRE BY STEAM.

Sir,—In No. 896 of your useful publication (vol. xxxiii, page 371,) Mr. Baddeley confounds the observations of two different speakers, in supposing the person who asserted that the Philadelphia firemen direct the stream of water to the lowest part of the fire, also asserted that the firemen of London now follow the same practice; and he concludes, that there is no dependance to be placed upon the statement respecting the Philadelphia, because the assertion is not true of the London firemen.

The fact is, that at the meeting of the Mechanical Section of the British Association at Glasgow, in corroboration of Mr. Wallace's proposal to extinguish fires by enveloping the burning mass with steam, I stated that it was the practice of the Philadelphia firemen to throw the stream of water from their engines upon the lowest part of the fire, for the express purpose of generating steam, to arise, surround, and thereby extinguish the higher parts: while the London practice was, to throw the stream of water upon the upper part of the fire, under the vain imagination that it would fall, as water, and drench the burning matter below. I added, that I had often seen at fires in London, the whole stream of water wasted, by being converted into steam while passing down through a small portion of the upper flame, without a particle of the water reaching the burning materials, and the steam going off into the air above. Upon this statement, a gentleman of high consideration in the scientific world observed, that I was in error respecting the London practice, for that he had been informed by Mr. Braidwood, the superintendant of the London Fire Brigade, that he always directed his men to apply the water to the lowest part of the fire, when practicable, for the very purpose of converting it into steam to extinguish the parts above.

I explained, that on my arrival from America, 37 years ago, I laboured to instil into the minds of the London firemen, the value of the Philadelphia practice, but without success, for many years during which I persisted in recommending the same, but as I approached old age, I avoided crowds, and therefore had not seen a fire, except at a distance, for several years past; I was therefore very glad to hear that the improved system had at last been adopted by Mr. Braidwood.

In conclusion, I assure Mr. Baddeley and your readers, that the mode which I have stated, was the regular practice in Philadelphia forty years ago. Mr. Baddeley appears to think that in the experiments alluded to, the fires were extinguished more by the exclusion of air than by the introduction of steam; in this he is certainly in error. For even if the air could be perfectly excluded, the extinguishing would go on so slowly, that more hours would be required to cool down the mass below the point of reignition on the admission of air, than it would take minutes to effect the same purpose by means of steam.

I am, Sir, yours, &c.

JOHN ISAAC HAWKINS.

Quality Court, Chancery Lane, Oct. 28, 1840.

[*Having referred Mr. Hawkins's letter to Mr. Baddeley, he has favoured us with the following remarks upon its contents.*]

Sir,—However incredible the fact may appear, relative to the absurd practice of the Philadelphia firemen, the testimony of Mr. Hawkins is sufficient warrant for its existence — but, "tis forty years since!" Experience has the effect of making people in all countries, both collectively and individually, wise; and I think there is little doubt the practice of the Philadelphians, like our own, both in this and in other matters,

is somewhat more rational than it was forty years ago. Had a practice so diametrically opposite to that of all other countries, existed at this time in Philadelphia, it is scarcely possible that it should have escaped the notice of all modern visitors; the inference therefore is, that it has long since been abandoned.

As Mr. Hawkins was dealing with names, it is to be regretted he did not give that of "the gentleman of high consideration in the scientific world" who made the unfounded statement respecting the London firemen. I have the authority of Mr. Braidwood for stating, that he never made such a communication as that attributed to him, to any person whether of "high" or low consideration; and if ever "the gentleman" alluded to was in communication with Mr. Braidwood at all, he must have either wilfully perverted or grossly misunderstood what was said to him. In Mr. Braidwood's interesting work on Fires and Fire Engines, published in 1830, he lays it down as an invariable rule "*that the water on its discharge from the director should strike the burning material.*"—"That this is a point to which every thing should be made subservient; and that this cannot be too often or too anxiously inculcated on every person having charge of fire-engines." The additional experience of the last ten years, in a more extended field of operation, has not induced Mr. Braidwood in the slightest degree to change or even modify this opinion.

From the concluding paragraph of Mr. Hawkins's letter, it may be inferred that the extinguishing of fires is a subject to which he has hitherto paid little practical attention. The great value and importance of the *air excluding system*, is every day becoming better understood, and we frequently witness the beneficial effects of its skilful application. I have observed with pleasure that this matter has been taken in hand by public lecturers, who by analogy and experiment have shown its philosophical correctness.

There are many people who entertain a sort of superstitious notion of the supernatural powers of steam, and imagine that because this mysterious agent does so much, it can do everything! As a motive power its application is almost universal, but any attempt to employ mere vapour as an extinguishing agent, under ordinary circumstances, is certain to be abortive.

I am, Sir, yours respectfully,

Wm. Baddeley.

November 2, 1840.

FIRE-ESCAPES—THE RIGHTS OF INVENTORS.

Sir,—I observe by your last Number you state, in answer to an enquiry, that no reward has been offered "for the best design for a fire-escape," which is perfectly correct. The enquiry is perfectly natural, and coincides with a notion which unfortunately too generally prevails—viz., that the lamentable loss of life which is continually taking place in this metropolis, is the consequence of no efficient fire-escape having hitherto been devised—that the difficulty or deficiency is a mechanical one—that lack of ingenuity is the occasion—and that the production of an all-sufficient instrument would make the fortune of its inventor. Nothing could be further from the truth, however, than this position; the fact is really the reverse. There are *several machines*, some of them long before the public, which, *if adopted*, would in most cases have prevented the deplorable catastrophes which we all lament, though our lamentation is in vain. So far from the existence of any mechanical deficiency, many of the plans submitted have been amply sufficient for most practical purposes; which of the several really good ones is the *very best*, may be a legitimate object for enquiry. So far from the subject of escape from fire being a profitable one for inventors to take up, the history of the last fifty years will show that it has never benefited a single individual. The sums of money expended in patents, in experiments, and in advertising, with all the other etceteras, which swallow up the scanty means of the inventor, have in no one instance been repaid. The Government, the Corporations, and the police authorities, have hitherto turned a deaf ear to the appeals of suffering humanity. Private individuals have not had the means, nor societies the inclination, adequately to remunerate the inventors, who, actuated at first probably by sympathy for their fellow-creatures, have been led to "take up the trade" of averting their dangers, but who have found no response from the unworthy objects of their care.

As long as great perseverance, extreme toil, and impoverishing expenditure must be encountered, to effect the sale of "single copies" of an invention, the inventor will most likely have the field to himself; but let a company or a corporation require several, so as to make the prize worth trying for, and then the inventor finds plenty of rivals ready to step into the arena, and without any previous study or outlay, and without the requisite experience, snatch from him that boon which should have been his recompense for the cares and anxiety of by-gone unproductive years.

The following quotation from the City report, published in your 898th Number, in juxta position with an extract from an advertisement in your last, may be taken as showing to what disreputable lengths this unrighteous principle of competition will sometimes lead *respectable* (?) tradesmen.

"Messrs. Harvey and Braidwood recommend the adoption of a certain number of sets of brigade ladders, on a fitting carriage, *with the rope, belt, and other conveniences to facilitate descent.*"	"The advertiser recommends the fire-ladders adopted by the London fire establishment, as being simple, fitting each other universally, and *without extraneous appendages to impede their application.*"

My experience has till recently been with fire-engines, rather than with fire-escapes; I have, however, paid enough attention to the latter subject to see through the groundless insinuation here attempted to be conveyed, and the object for which it has been put forth. I find that all the fire-escape inventors of the last half century have considered it necessary to append some "*conveniences*" or other "*to facilitate descent;*" and that from Davis* downwards, all the advocates for the employment of ladders, of whatsoever form, have, without a single exception, equipped their machines with "a cradle" or other appendage for this purpose. As a merit is attempted to be made of the bare ladders, "without extraneous appendages," I beg to observe that, in the first place, they are *unsafe and inefficient as police fire-escapes*, without what the advertiser is pleased to call "extraneous appendages;" secondly, that these useful appendages, as applied to Merryweather's ladders, *do not in the slightest degree impede their application.*

The ingenious but ill requited Gregory has been toiling in this "labour of love" more than twenty years. In January, 1819, he patented his improvements in fire-escape ladders, and quitted his profitable avocation of a shipwright to minister to the then apparent wants of his fellows. His ingenuity has not been exclusively devoted to escape from fire—the perils of the ice and the fatal consequences of external window cleaning have been the successful objects of his care. For my acquaintance with many of these creditable productions I am proud to acknowledge my obligations to your indefatigable correspondent, Mr. Baddeley, whose continual advocacy of inventions rather than inventors, shows his object to be the promotion of public rather than private good.

The recent "movement" in the City—the very necessity for which reflects the most enduring disgrace upon the authorities—exhibits in a striking manner the ordinary fate of inventors and improvers. The two plans selected for adoption are palpably the portable fire-escape ladders of Merryweather, and the sliding carriage ladders of Gregory; but it is more than probable that neither of these parties will have a chance of obtaining, or even of competing for, the honour or pecuniary advantage of furnishing these contrivances, which they have respectively brought to perfection! Methinks I see the object of the "*improving*" hand, alluded to by Alderman T. Wood, as reported in your last Number, and can only express my surprise that upright men of business should sanction proceedings collectively, of which individually they would be thoroughly ashamed. Depend upon it the claims of justice and the rights of inventors are identical with, and inseparable from, the rights of

HUMANITY.

Lombard-street, November 9th, 1840.

* Rewarded by the Society of Arts in 1809.

CITY FUNDS v. CITY FIRE-ESCAPES.

Sir,—The City authorities occasionally make a wonderful parade of their love of economy, apparently quite aware of the extremely slender reputation they possess for the exercise of this virtue; consequently, the subject of *fire-escapes* not being a legitimate source of feasting, the smallest possible sum must be expended for their introduction to the City.

The pretence of husbanding "the city funds," is a miserable excuse for withholding a due and efficient protection of life and property, when so trifling an addition to the outlay at present incurred, would effectually accomplish that object. The idea is quite absurd as emanating from the Court of Aldermen, because they are now expending 600*l.* a year in printing and circulating among themselves a "Sessions Paper." The public have long since abandoned any interest in its publication, and yet it is kept up for the purpose of adding to the library of the Aldermen and Common Council. £600 a year can thus be expended for the personal gratification of the corporation members, while one outlay of a similar sum to ensure the protection of the lives of all the citizens is miserably begrudged. It has been shown in your pages, that the outlay of this sum, with an annual expenditure of 20*l.* a year, would provide for our safety for ever!

If the city coffers are so low, the profits of the City School might be advantageously appropriated to the purchase and maintenance of fire-escapes. In this school fifty boys are taught by one master, who receives about 120*l.* year. The boys' parents pay 420*l.* a year; the profits therefore upon this transaction, would more than suffice to support a numerous, and well-appointed fire-police. Other resources could be pointed out, but this may suffice for the present.

I am, Sir, yours, &c.,

A CITIZEN.

Ivy-lane, Nov. 5, 1840.

[We cannot understand why there should be any pecuniary difficulty in the case. If the whole sum required was obtained by a slight addition to the present police rate, it would be so trifling as to be altogether beneath notice, while its judicious application would be highly popular throughout the city. ED. M.M.]

NEW PUBLICATIONS.

Directions for using Philosophical Apparatus in Private Research and Public Exhibitions. By EDWARD M. CLARKE. Part I. 72 pp. 8vo. Author, 428, Strand.

Mr. Clarke, the popular lecturer on optical subjects at the Royal Adelaide Gallery, and no less eminent as a *philosophical* instrument maker (in the truest and largest sense of the term), has presented us here with the First Part of a work which promises to be of considerable magnitude, and will, we feel assured, be universally hailed as a much-needed and most valuable contribution to practical science. The author proposes to give "plain and simple directions for the use of *every article of philosophical research*"—to do for all experimental philosophy, in short, what Professor Faraday has done so well for one important branch of it in his "Chemical Manipulations." The specimen Part before us is confined to the gas microscope and its manifold wonders; and is so well executed throughout, that he must be hard to please who could desire more than to see all the forthcoming Parts equally good. The "Directions" are exceedingly full, distinct, and clear; and the wood-cut illustrations not only abundant to profusion, but of a very superior character. The second Part, which we hope will not be long in making its appearance, is to be occupied with the construction of the Polariscope and the various phenomena of the polarization of light.

The Excise Officers' Manual and Improved Practical Guager; being a compendious introduction to the business of Charging and Collecting the Duties of Excise. By J. BATEMAN. 354 pp. 12mo. Maxwell.

Time was when we had no Excise, and being of the opinion of Marvel that it is a very hateful, pernicious, and unconstitutional mode of raising a revenue, we may be permitted to hope that such a time will come again. While the system exists, however, it is manifestly of great importance that it should be based on some fixed principles of universal application, and that these principles, and the various modes of working them out, should be made familiar to every one of the numerous and widely scattered body of persons who must of necessity be employed to carry the system into operation —and this not more for the sake of the public revenue, than for the sake of those of the lieges who are forced in this way to contribute to it—since even in the suffering of hardship and injustice, there are rights of equality which should by no means be disregarded. It would assuredly be long before we could bring ourselves to see with the author of the work before us, "a useful *hive* of the commonwealth" in a host of Excise Officers;—for where there is no honey we can scarcely expect bees; but we readily admit, that the better informed these officers are—(the more *geometrically* the *spiders* do their work?)—the better it will be for all classes and all interests. Neither can a subject which has occupied the talents of such men as Simpson and Hutton and Young, be unworthy of any degree of genius and talent which can be devoted to its elucidation. The standard book of this class has been for a long time "Symons's Guager;" but that must at last give place to the greatly superior work now before us. Indeed, Mr. Bateman tells us that he had at first only contemplated giving a new edition of Symons, and that it was only as he proceeded in his task, and found alterations and additions accumulating, that he judged it expedient to make a new book of it altogether. *Bateman's Symons*, as it may therefore not be improperly called, is now an exceedingly complete work, comprehending everything which an officer desirous of doing his duty well, and of qualifying himself for the highest as well as humblest offices of his department, ought to know, and no more. We have first, complete treatises on the arithmetic, of simple numbers, and of quantities; and on the mensuration of lines, angles, superficies, and solids, including a great variety of most useful arithmetical and mathematical tables, very neatly and correctly printed. We come next to the master subject of the book—gauging—which is extremely well treated of in all its branches. In the sliding rule which Mr. Bateman recommends for adoption, we are glad to observe that he has adopted the line of special gauge points X, invented by our esteemed correspondent, Mr. Woollgar (see *Mech. Mag.*, No. 849), and does full justice to its valuable properties. Following these scientific portions of the work is a very full account of the Excise establishment, the duties of its numerous departments, forms of procedure, regulations, &c., and an alphabetical arrangement of the various articles and things subject to Excise—which last, while it does great credit to Mr. Bateman's powers of condensement and classification, may well make the judicious grieve, to think that so much ingenious pains should have been taken to thwart, embarass, and cripple the industry of the country.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ARTHUR WALL, OF BERMONDSEY, SURGEON, *for a composition for the prevention of corrosion in metals, and for other purposes.* —Roll's Chapel Office, October 15, 1840.

This composition is prepared in the following manner:—20lbs. of strong muriatic acid are diluted with 3 gallons of water and

placed in a shallow cast iron vessel; 112lbs. of steel or iron filings are heated to redness and quenched in the diluted acid to effect their oxidation: to facilitate this action, the pan is placed on a furnace or sand bath, and the contents repeatedly stirred for about 24 hours or until ebullition takes place, the liquor is then drawn off, and the foregoing process repeated with such portion of the filings as remain unoxidized. The oxide thus obtained is exposed on a red hot iron plate, till all the moisture has been driven off, and the oxide assumes a red appearance. When cold 16lbs. of quicksilver are to be added to the mixture, by sifting through a fine sieve, and afterwards intimately incorporated in a mortar; enough water to cover the surface is then poured over it, and from 8 to 9lbs. of strong nitric or nitrous acid added; this mixture is to be placed in a sand bath till all the moisture is driven off. When the mass is dry it is to be well pounded in a mortar till it assumes a uniform state of blackness. All the finer particles are to be separated by washing in water, and left to settle; the sediment is to be placed in a crucible or earthern retort with a receiver attached to collect any chloride or mercury that may come over. When red hot plunge it into fresh boiling water, stir it well and leave it to settle, then draw off the water and add any chloride that may have come over into the receiver. Then add one-fourth of its weight of common black or red lead according to the colour desired. This composition is to be mixed with boiled linseed oil with one-fifth of spirits of turpentine, and applied as thinly as possible with a brush to the sheets of metal to be protected. The metal coated in this manner is to be dried by the application of heat, beginning with a low temperature, and gradually raised to about 300° of Fahrenheit, so as to make the metal "*imbibe*" (!) the preparation.

The claim is, for the invention of the composition prepared as above described, for the prevention of corrosion in metals, and for other purposes.

FRANCIS MOLYNEUX, OF WALBROOK BUILDINGS, LONDON, GENTLEMAN, *for improvements in the manufacture of candles, and in the means of consuming tallow, and other substances for the purposes of light.* Enrolment Office, October 23rd, 1840.

These improvements are of two kinds, the claim being—1st, To a mode of applying cylinders, or blocks of tallow, or other suitable substances, which are formed without wicks, for the purpose of being consumed in lamps. 2ndly. A mode of applying air to carriage lamps. The mode set forth in elucidation of the first claim is so exceedingly similar to that of Messrs. Crosse and Blackwell, described in our 899th Number, that we need not repeat it here. The only difference between the two is in the construction and application of the wick, which we think inferior to Messrs. Crosse and Blackwell's plan.

The object of the second claim is accomplished by supporting the socket of the lamp upon a series of small tubes, which, passing through the bottom of the lamp, allow free entrance to the atmospheric air, and thereby tend to perfect the combustion.

HENRY MONTAGUE GROVER, OF BOVENEY, BUCKINGHAM, CLERK, *for an improved method of retarding and stopping railway trains.*—Enrolment Office, November 2, 1840.

The "method" here patented, if not an improved, is at least an abundantly "singular" one. From the lower frame of the carriage or truck a wooden block or box is suspended by a bar link, within about half an inch, more or less, of the wheel; this box contains a large soft iron horse-shoe, enveloped with wire helices for converting it into a powerful electro-magnet when its good offices are required. From these helices, wires proceed up into the carriage where a galvanic battery is situated, and with which they can be connected at pleasure. Should any accident or other circumstance render it expedient to retard or stop the train, connecting the wires with the battery converts the horse-shoe into a powerful magnet, which, hanging within a "striking distance," catches hold of the rim of the iron wheel, pressing itself and the wooden box against it, after the manner of the brakes usually employed. The patentee states that these electro-magnetic brakes may be applied to one or more of the wheels of a train, or the apparatus may be applied to one wheel, and its action transmitted to other wheels by means of levers. We apprehend Mr. Green has greatly underrated the extent of power required to arrest the progress of railway trains, and the electro-magnetic power capable of being obtained by the means he proposes

THOMAS GADD MATTHEWS AND ROBERT LEONARD, OF BRISTOL, MERCHANTS, *for certain improvements in machinery or apparatus for sawing, rasping or dividing dye woods or tanners' bark.*—Roll's Chapel Office, Nov. 5, 1840.

These improvements consist in certain arrangements of circular saws, by means of which, woods or bark are reduced to a finely divided state for the use of dyers and tanners, in a more economical and expeditious manner than has heretofore been effected. The peculiar feature of this invention is, combining a number of circular saws upon a rotary spindle in such a manner that although not in actual contact, they are placed so nearly contiguous to each other, that when a piece of wood, or a quantity of bark is brought under their operation, it will be sawn, rasped, or reduced to a finely divided state without leaving any veneer. The circular saws are

mounted on their spindle by obliques thereto, and the space between each saw is filled up with pieces of wood, felt, metal, pasteboard, or other suitable substance, the saws are then secured between two cheeks by nuts and screws. The log of wood is placed upon an inclined plane, and made to slide down towards the saw by a pushing apparatus, consisting of a worm wheel, rack and pinion, driven by suitable gearing connected with the prime mover of the machine. A counterbalance weight is attached to the rack by a cord passing over a pulley, to facilitate its ascent up the inclined plane, for the introduction of a fresh log of wood. The claim is to the application of rotary circular saws to the sawing, rasping, or reducing to powder of woods or bark, for the use of dyers or tanners in whatever manner the same may be applied.

George Mackay, of Mark-lane, Ship-broker, *for certain improvements in rotary engines.*—Rolls' Chapel Office, Nov. 5, 1840.

A large metal wheel of any suitable width is mounted on gudgeons in a strong frame; six projections, angular on one face and flat on the other, are placed at equal distances around the rim of the wheel. A quadrant shaped groove or race is supported by the frame over the wheel, furnished with a steam pipe at the one end, and an eduction pipe at the other, answering to the ordinary steam cylinder.

On admitting the steam to the reservoir or quadrant, its elastic force is exerted between an entrance valve which opens only inwards, and cannot yield but acts as an abutment, and the projection on the periphery of the great wheel; the latter, exactly occupying the space between the outer rim of the wheel and the interior of the quadrant, is driven forward, receiving on its surface the full force of the steam, until it reaches the mouth of the eduction pipe, when it lifts and passes out through the exit valve, which is immediately closed again by the action of a strong spring. Another of the projections, has in the mean time entered the quadrant, and is acted upon in a similar manner; the motion being equalized by a fly-wheel.

The construction of the entrance valve is so arranged, that when it opens, a lever attached to it closes the steam-cock, which is reopened by the descent of the valve; so that the steam is always shut off during, and readmitted after the entrance of each projection. The closing of the entrance valve is effected by a spring, connected with a click and ratchet, so as to regulate its strength at pleasure. The patentee does not confine himself to the precise form or arrangement of mechanism shown, but sets forth the above as a convenient mode of carrying out his invention; he does not claim any of the parts separately but simply as they are used in combination.

Auguste Moinau, of Philpot Terrace, Edgeware Road, Clock-maker, *for certain improvements in the construction of time-keepers.*—Rolls Chapel Office, November 9, 1840.

This invention, or improvement, consists in certain novel modes of producing or communicating an impelling power for giving motion to the works of clocks, or other stationary machines designed to indicate mean time, by dispensing with the use of impelling springs, and adopting in lieu thereof a series of detached weights, which are raised and brought into operation by means of the impelling apparatus. We altogether despair of making our readers acquainted with all the *ingenious contrivances* and mechanical minutia of this patent, the description of which occupies four skins of parchment, and is illustrated by 41 explanatory drawings, some of the most intricate character; the value of this *loss* will, however, be tolerably apparent from the following epitome of the subject. In the first instance motion is given to the arbour of a large wheel, by means of weights in the form of small balls, which drop into appropriate cups placed at the extremities of the arms of the wheel.

These balls are placed in an inclined tube above the wheel, and are dropped at proper intervals into the cups as they present themselves for their reception, and by their gravity produce rotation of the wheel, thereby impelling the train of wheels constituting the time-piece. The balls drop from the cups, as they approach the vertical position, into a receiving tube placed below, from whence they are returned to the elevated position ready for another descent, by natural—not supernatural—agency. In order to effect the resurrection of "the fallen" weights, a lever is appended to the room door, from which a rope passes over a complicated system of weights and pullies, which being set in motion every time the door is opened or shut, raises at each movement a certain number of balls and so replenishes the moving power of the clock. The rise and fall of the water level in a water-but, is also made to accomplish the same end; and if the house should be furnished with neither doors nor water-but, a *smoke-jack* is then pressed into the service. Two modes of appropriating these motions to the elevation of the balls, is shewn; the first is by a system of levers, the second by Archimedes' screw. Should it turn out hereafter that the subject matter of this patent is no improvement, one thing we think is certain, viz. that it is perfectly safe from infringement!

Errata.—Page 422, first column, 27th line from top, for "7th July last," read "7th July, 1837."

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MASON'S IMPROVED COTTON WHIPPER.

Fig. 2.

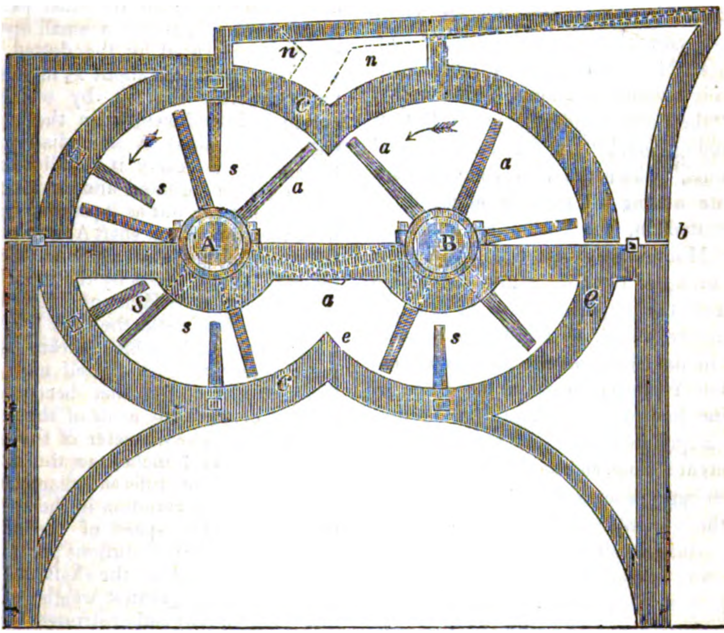
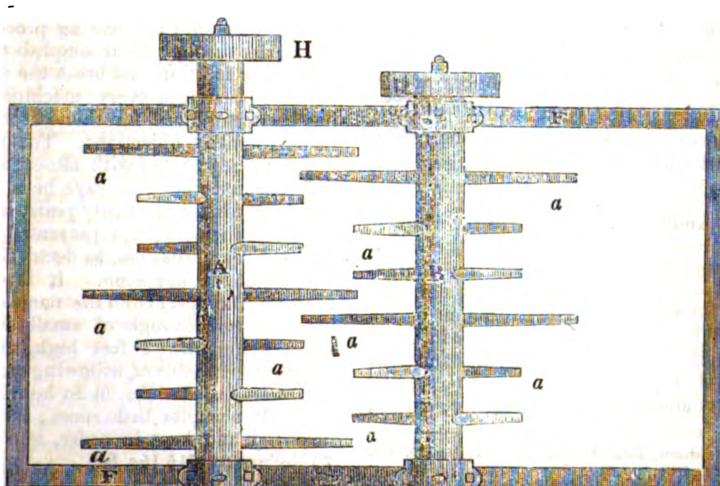


Fig. 1.



MASON'S IMPROVED COTTON WHIPPER.

We extract the following description of an improvement in the cotton whipper, recently introduced into the cotton factories in the United States, from a very interesting and highly useful work on "the Cotton Manufacture of the United States of America, contrasted and compared with that of Great Britain, by James Montgomery,"* a gentleman already favourably known by his works, on "the Theory and Practice of Cotton Spinning," and "the Cotton Spinners' Manual," which are deservedly in high repute among all persons engaged, or interested in, the cotton manufacture. Mr. Montgomery left Scotland in the beginning of 1836, intimately conversant with all the practical details of this manufacture, as followed in Great Britain; and he has since, as the superintendent of the York Factories in the State of Maine, had full opportunities of becoming acquainted with all the points of difference between the English and the American processes. The elucidation of these points of difference has been the principal object of the work before us; but it contains at the same time a large mass of useful and highly interesting matter connected with the rise, progress, and present state of the cotton manufacture throughout the United States—"the most formidable rivals with whom the British have to compete"—as well as statistical notices of the various manufacturing districts of those States, equally interesting to the manufacturer and to the general reader.

Description.

"Another modification of the whipper has been lately introduced: the writer has had one of them under his charge, and regards it as the best and simplest, as well as the cheapest machine of the kind he has yet known either in Great Britain or America. See fig. 1 and 2 on our first page. A B are two parallel shafts about 2½ inches diameter; *a a a a*, &c. are arms, or spikes, about 6 inches long, and fastened into the shafts. The shaft A is surrounded with a gird or harp from *c* to *c*, and the shaft B has a harp from *e* to *e*. The gird has several bars containing spikes pointed inwards; see *s s s s*. The front of the machine is open from *b* to *b*; all the other parts of it are enclosed, except a small opening above, represented by the dotted lines *n n*: this opening is about 2½ inches, extending across the top, by which the cotton is introduced, when the revolving arms of shaft A immediately take hold of it and carry it rapidly round, and it is thus agitated and torn against the spikes *s s s*; but as it proceeds round with the arms of the shaft A, it is met by the arms of the shaft B, which clear it off, and throw it out by the mouth *b b*. The belt pullies G H are of different diameters, so as to make the shaft B revolve faster than A, by which means it has more power, and frees itself more perfectly of the cotton that becomes entangled between the arms of the revolving shafts. The diameter of the pulley G is 6, and H 7 inches, or the driving drum may be of different diameters, to effect the same variation in the speed of the shafts. The speed of the shaft B ought to be 1800 revolutions per minute, and A 1600; and as the shaft A has to carry round the greatest weight of cotton, it is generally rather stronger than B.

"As the chief use of the willow is to open or separate the clotted tufts of cotton, so as to make it spread at the following machine; the tearing process it must pass through to accomplish this is very liable to injure and break the tender staples; therefore every machine that has been employed for this purpose, is liable to many objections. The writer has been acquainted with almost all the different machines that have been in *general* use for the last thirty years, and he considers the whipper, represented in the annexed representation, as decidedly the best which he has seen. It is called Mason's Whipper, from the name of the inventor, and though of small dimensions, being only 3 feet high, and 2½ broad, it is capable of willowing one bale of upwards of 400 lbs. in an hour and a half. It occupies little room; is easily managed and kept in order, and costs 75 dollars = £15 15*s*. 6*d*.

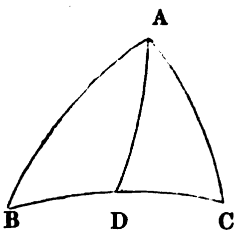
* Glasgow, John Niven, jun., London: Whittaker and Co., pp. 219.

QUESTION IN SPHERICAL TRIGONOMETRY.

Sir,—In solving an astronomical problem some time ago, I had to find the length of a great circle drawn from A to bisect B C in D. I discovered a very simple method of doing so, and as it is new, as far as I know, you will perhaps consider it worthy of a place in your useful journal. I am, Sir, yours, &c.,

GEORGE SCOTT.

October 19, 1840.



Formula for finding A D, the three sides of the triangle being given—

$$\text{Cos. } AD = \cos.\left(\frac{AB+AC}{2}\right).\ \text{Cos.}\left(\frac{AB-AC}{2}\right).\ \text{Sec. } BD.$$

Demonstration.

By spherics $\cos. ADB = \dfrac{\cos. AB - \cos. AD, \cos. BD}{\sin. AD, \sin. BD}$;

also, $\cos. ADC = \dfrac{\cos. AC - \cos. AD. \cos. DC}{\sin. AD. \sin. DC}$;

then, if one of the angles, as A D B be obtuse, the other, A D C will be acute; hence, $\dfrac{\cos. AD. \cos. BD - \cos. AB}{\sin. AD. \sin. BD} = \dfrac{\cos. AC - \cos. AD. \cos. DC}{\sin. AD. \sin. DC.}$ $\therefore$ 2 cos. A D. cos. D C = cos. A B + cos. A C = $2\cos.\left(\frac{AB+AC}{2}\right).\ \text{Cos.}\left(\frac{AB-AC}{2}\right)$;

that is, $\cos. AD = \cos.\left(\frac{AB+AC}{2}\right).\ \text{Cos.}\left(\frac{AB-AC}{2}\right).\ \sec. BD.$

Q. E. D.

SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—The letter of your intelligent correspondent, "Scalpel" in your last number affords me much satisfaction, as it proves that the merits of the invention, known as *Symington's Method of Condensation* are beginning to be properly appreciated.

Having been one of those interested in bringing forward the invention, I beg leave to assure him that he is in error in saying that we ever had the "bad taste" to attempt to cram it down the throat of "A Public Company," for, we always acted with a delicacy and generosity to that company, of which they proved themselves but little deserving.

Perfectly prepared to substantiate what I have now advanced, I shall at my earliest leisure forward to you for the perusal of "Scalpel" the facts of the case, feeling satisfied that they have only to be examined to show that in doing justice to the invention, he has not done full justice to the conduct of those to whom it belongs.

I am, Sir, your obedient servant,

ROBERT BOWIE.

44, Burr-street, November 10, 1840.

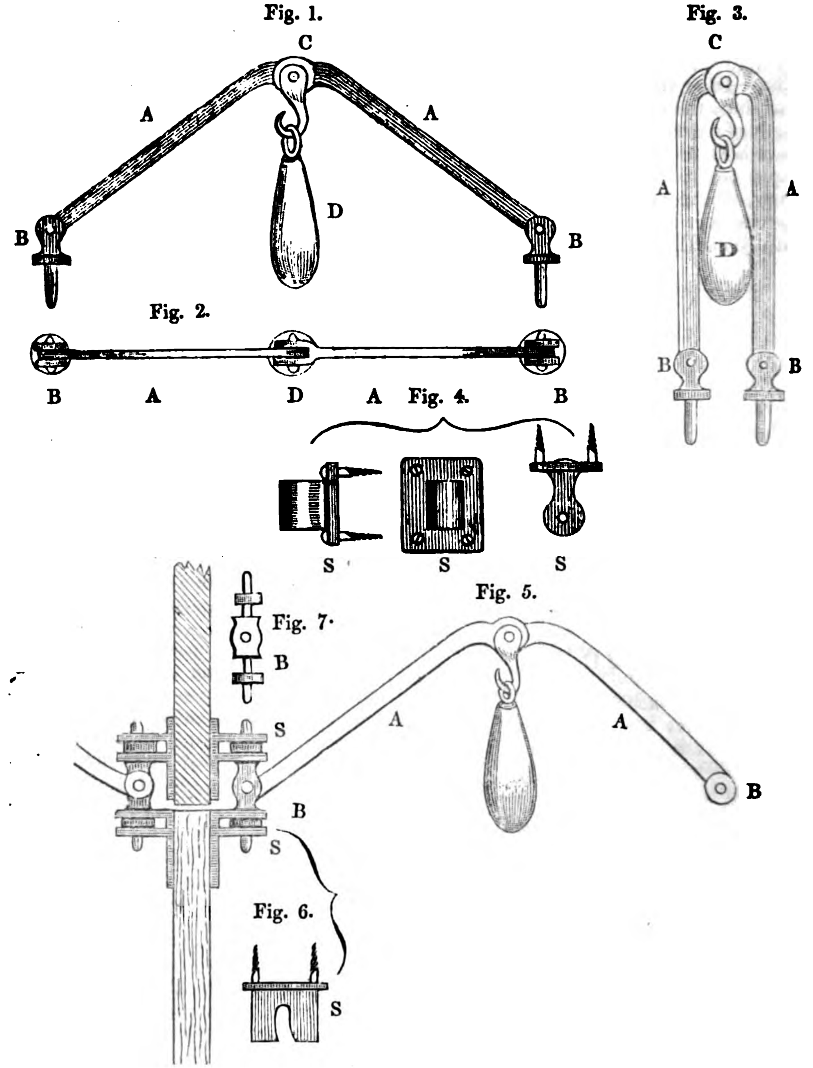
THE "FATHER THAMES."

Sir,—In noticing "A Subscriber's" communication in your last Number, I beg to inform him that the 26th of September last, was one of the days on which the *Father Thames* beat the *Eclipse*, and of which I was an eye witness. All the dimensions of the *Father Thames* have been given both by "A Subscriber" himself, and by "Candidus," so that it is needless to repeat them here. All that remains to be mentioned is, that she has a *fan* for encreasing the draught, as it is a *tubular* boiler. I have also "taken another trip" to Gravesend, but I am still unable to discover the great *vibration* complained of by "A Subscriber." The "rattling of the funnel" did not proceed solely from the arms (which are exceedingly long and slim, and consequently, very pliable,) striking the sides, but the steam chest cover is, or was not, in a state of completion, and "A Subscriber" might have found a foot or more in two or three places without a single rivet. I imagine the reason the captain has orders to *stop* when the *Eclipse* "comes alongside," is that the owners of *Father Thames* have too much respect for the lives of their passengers, to risk running their boat alongside a high pressure one. Also, that *two* engineers being employed, arises from the peculiar construction of the engines; the hand gear is necessarily far apart, and it requires some little exertion to work it. But for my part, I cannot understand that one engineer, or two, or twenty, can possibly have anything to do with the speed of the boat.

I am, Sir, your obedient servant,

T. D. S.

October 26, 1840.



Sir,—I beg to hand you a description of the Russian door closer which is well worthy your attention : it has been above two years in use here pretty generally.

Hitherto it has only been applied to doors opening one way, and in its usual form consists of two jointed legs A A, (fig. 1, 2 and 3) having a compass joint at C, and similar ones in the heads of the studs B B; from the joint C, a weight hangs, the effect of which is to push the studs B B outwards.

Socket plates (represented in three views, fig. 4,) being fixed to the door, and to a corresponding plan on a wall, or on a stay projecting from one, the stud pins of B B being put into the socket holes, it is evident, that if the door be opened, the studs will approach one another until the apparatus assume the position of fig. 3, when the weight will cease to act, and the door will remain open, but if the apparatus be so adjusted, that when the door is fully open the legs shall not be quite parallel, it will begin to close again the moment it is let go, and the more obtuse the angle at C is made to be, the greater will be the power

of the apparatus to maintain the door in its shut position.

To apply this apparatus to a door opening either way, some change is required. In the first place, a pair of the jointed legs and a weight will be required on each side of the door, and the apparatus must be elevated to the level of the lintel, as shown at fig. 5, the socket plate, fig. 4, will still answer for the attachments to the walls, but the extremity, which acts on the door, must take the form shown at B, fig. 5 and 7, and the socket plates S, must be similar to that shown at S, fig. 5 and 6, and instead of a hole for the stud, as in fig. 4, there must be cuts, as in fig. 6, the sides of which should be arcs of circles, of which the hinge of the door is the centre.

By this arrangement, when the door has been pushed by one portion of the apparatus into its shut position, the stud B (fig. 5), will have engaged itself in the socket plates on the lintel, and will be incapable of extending further, the door may however be pushed onwards against the pressure of the other portion of the apparatus, as the pin of B has no hold on S, when that is pushed away from it. This plan is certainly not so sightly in a private dwelling house as the concealed spring boxes; but in public places when the doors are constantly kept in motion, I apprehend it would be invaluable, as there is no part of it likely to show any sensible wear in a century.

The above description will, I trust, suffice to explain the principle of the apparatus, and every intelligent mechanic who may wish to apply it, will be able to devise the modifications in the form and adjustment of the parts which particular cases may render necessary.

I am, dear Sir, very truly yours,

K. H.

Edinburgh, November 1, 1840.

CAN OTHER METALS BE BLOWN AS WELL AS GLASS?

Sir,—Being of opinion, that in a proper atmosphere it would be practicable to blow other metals than glass, and that such a result would be of infinite value in mechanics; give me leave to ask of some of your ingenious correspondents, if they have ever heard of such an experiment in any country—and what sort of a furnace it would be proper to construct to try it, as well as the proper air and instrument to be employed in giving expansion to the melted metal—whether lead, copper, silver, or gold, or any admixture of them? I by no means think the result impossible, with a suitable apparatus, and if it can be accomplished, I foresee great advantages in its success to the arts.

Allow me therefore to place this suggestion in your useful repository of mechanical speculation. Although I am quite aware of the want of adhesiveness in the common metals to any solid body, however fluid they may be, and of the difficulty, on account of their ponderosity to expand them by common means; yet by bending the end of the blow-pipe into the form of a cup we might perhaps facillitate the operation.

I am, Sir,

Your obedient, humble servant,

GEORGE CUMBERLAND, SEN.

Culver-street, Bristol, October 28, 1840.

ON THE COMPARATIVE ADVANTAGES OF BLACK AND WHITE PAINT.

Sir,—A paragraph copied from the Transactions of the Society of Arts, has appeared in several periodicals and newspapers within the last twelve months, asserting that *black* is the *worst* colour for painting wood work in the open air while a writer in the *Penny Cyclopædia* (Art. Painting) states that *black* is the *most durable*. Perhaps your noticing this, may induce some of your able correspondents to favour your readers with further information on the subject which is of considerable importance.

Yours respectfully,

J. W. D. JAMES.

No. 7, Queen-street, Camden-Town,
October 26, 1840.

The communication referred to by Mr. James, was made to the Society of Arts by Mr. W. Kennish, carpenter on board H.M.S. *Victory*, and for which he received the thanks of the Society in their Session for 1837-8. As this paper is one of considerable merit, relating to a subject of great practical importance, we have extracted it verbatim from the Society's Transactions for the information of our readers.

Remarks on the disadvantages that attend the use of Black Paint on board ship.

"There is nothing that will prove this evil more than by observing the black streaks of a ship after being in a tropical climate for any length of time. It will be found that the wood round the fastenings is in a state of

decay, while the white work is as sound as ever: the planks that are painted black will be found split in all directions, while the frequent necessity of caulking a ship in that situation likewise adds to the common destruction; and I am fully persuaded, that a piece of word painted white will be preserved from perishing as long again, if exposed to the weather, as a similar piece painted black, especially in a tropical climate.

"I have heard many men of considerable experience say, that black is good for nothing on wood, as it possesses no *body* to exclude the weather. This is indeed partly the case; but a far greater evil than this attends the use of black paint,which ought entirely to exclude its use on any work out of doors, viz.: its property of absorbing heat. A black unpolished surface is the greatest absorber and radiator of heat known; while a white surface, on the other hand, is a bad absorber and radiator of the same: consequently black paint is more pernicious to the wood than white. This may, and has been proved, by innumerable experiments; but the following simple experiment may perhaps be considered worthy of notice:—Take four pieces of tin plate and place them together in pairs, having the inner surface smeared with lard so that they may adhere together; then colour one pair black, leaving the other white, and suspend them equidistant from a small iron ball made red hot: it will be found that the black surface presented to the ball absorbs the heat, and soon gets charged sufficiently to melt the lard, and the result is that the two plates immediately separate; on the other hand, the white remains firm, as the rays from the heated body are for the most part reflected by the white surface.

"The foregoing experiment plainly shows, that wood having a black surface will imbibe considerably more heat in the same temperature of climate than if that surface was white; from which circumstance we may easily conclude, that the pores of wood of any nature will have a tendency to expand, and rend in all directions, when exposed under such circumstances,—the water of course being admitted, causes a gradual and progressive decay, which must be imperceptibly increasing from every change of weather. The remedy to so great an evil is particularly simple; viz.: by using white, instead of black paint, which not only forms a better surface, but is a preventive to the action of heat, and is more impervious to moisture. The saving of expense would also be immense, and I am convinced that men of practical experience will bear me out in my assertion.

"Two striking circumstances, which have fallen under my own immediate notice, deserve mention. The first was the state of H. M. Sloop *Ringdove*, condemned by survey at Halifax, N.S., in the year 1828.

"This brig had been on the West India station for many years. On her being found defective, and a survey called, the report was to the effect that the wood round all the fastenings was totally decayed in the wake of the black, while that in the wake of the white was as sound as ever; a striking proof of the different effect of the two colours.

"The next instance I shall mention relates to H. M. ship *Excellent*, of 98 guns (formerly the Boyne.)

"This ship is moored east and west, by bow and stern moorings; consequently, the starboard side is always exposed to the effects of the sun, both in summer and winter. In this situation her sides were painted in the usual manner of a ship of war; viz.: black and white, of which by far the greater part is black; this latter portion on the starboard side I found it impossible to keep tight; for, as often as one leak was apparently stopped, another broke out, and thus baffled the skill of all interested. In the meantime, the side not exposed to the rays of the sun remained perfectly sound. I then suggested to Mr. Kennaway (the master-caulker of her Majesty's dockyard at Portsmouth), who had previously given the subject consideration, the advantage likely to be derived from altering the colour of the ship's side from black to white. Captain Hastings having approved of the alteration, the ship was painted a light drab colour where it was black before, upon which the leaks ceased, and she has now continued perfectly tight for more than twelve months; and, indeed, I can confidently state, that the ship will last as long again in her present situation, as she had begun to shrink and split to an astonishing extent when the outside surface was black, and had which entirely ceased since the colour was altered.

"Instances of the injurious effects of black paint on shipping generally, also on the masts, yards, boats, &c., are of daily occurrence, and decidedly point out the benefit likely to result from the substitution of the one colour for the other, and manifest advantage to be derived from its use by the maritime interest, though I am aware some may object to its use as not being ship-shape To such I have only to state, that the application of copper to ship's bottoms, and the use of chain for cables, have already met with the same foolish objection at the time of their introduction, since which period thousands of valuable lives, with property to a large amount, have been saved by their instrumentality."

QUESTIONS IN PLASTER CASTING.

Sir,—I have not addressed you until I found the information I am in search of, unattainable by any other means in my power.

I should therefore be much gratified by being informed through the medium of your Magazine, of the best materials for constructing moulds; so as to obtain fine impressions from bas-reliefs in plaster of Paris without injury to the colour or texture of the originals; and, whether the plaster needs any previous treatment, and, if so, of what kind?

If any thing being added to the plaster will harden it and render it capable of taking a finer impression than is usual?

What moulds are necessary to the casting of wax; and the preparation they may require previous to casting from them. I may perhaps venture to express a hope that the information I have requested may, by being widely diffused, be of use to many in the same circumstances with,

Your obedient servant,

J. R.

NEW PUBLICATIONS.

Instructions for the Multiplication of Works in Metal by Voltaic Electricity. By THOMAS SPENCER. 8vo. pp. 62. Glasgow, Griffin and Co.; London, Tegg.

The New Art, the practice of which it is the purpose of these "Instructions" to facilitate and promote, is beyond all question the most valuable contribution which Science has made to the Workshop in modern times; and no less certain it is that to Thomas Spencer, the ingenious and hardworking tradesman of Liverpool, and none other, the world are indebted for its discovery. The rival claim set up by Professor Jacobi, of St. Petersburgh, has always appeared to us so utterly groundless, that we have observed with astonishment and disgust the countenance which it has received from the higher scientific classes of this country. It is not only not true, that Jacobi suggested before Mr. Spencer the application to workshop purposes of the long well-known scientific fact, that a voltaic current passed through metallic solutions will precipitate the metal contained in them; but it is evident, from the extreme want of practical knowledge and skill displayed in all that has emanated from the Professor, that such a suggestion was quite beyond the range of any shot in *his battery*. Where in all that he has ever put forth on the subject *before the appearance of Mr. Spencer's papers* shall we find evidence of his knowledge of the simple yet most essential fact, that the precipitate takes place in a solid and homogeneous—not friable or brittle—state? We venture to say, that up to the disclosure of Mr. Spencer's successful experiments on this point, neither the *Professor* (most appropriate phrase), nor any of those who now so disgracefully uphold his pretensions, to the injury of a countryman of their own—of whom any country might be proud—had the remotest idea that such would be the case. If he or they, or any of them had, let us see the proofs.

With equal truth and modesty Mr. Spencer observes, in the Preface to the Treatise before us—

"Few who watch the progress of events can doubt, that had this discovery not been made at this present period, a very brief additional time would have brought it under public attention. Scientific facts were all tending toward it. The great discoveries of the last age were being condensed and combined into the elements of learning for this. Trains of scientific thought which had been long and curiously laid, only required the aid of the match to explode them simultaneously."

Granted that Mr. Spencer only furnished "the match" which produced the explosion —the happy thought which brought to instant fruition many long years of speculative contemplation—who shall say that he is on that account the less deserving of honour and reward? What have all our most valuable discoveries and inventions been but happy thoughts—but matches suddenly applied to long preexisting trains?

Of the great value of the Art, and of the wonderful rapidity with which our mechanics are everywhere turning it to account, we shall leave the Author of it himself to speak.

"There are few branches of manufactures in any way connected with art, that will not benefit by the adoption of this principle. Already it is in active operation among calico printers. Potters can now afford to pay for the highest art to design and engrave one plate, as they may have any number of duplicates equal to the original, at little more expense than the price of the copper. The copper matrix for type founding, however elaborate, may now be produced with the greatest facility, and at a trifling expense.

"Wood engravings may now be copied in copper to any extent, and the finer lines which could not be obtained in the original, may be put into the copper fac-similies with facility. Even in stereotyping it may ultimately be found as economical as the method in common use, and certainly much better.

"Elegant designs are deposited on plates in relief, from which embossed cards are printed; in short, there is scarcely a department connected with the elegancies and refinements of life, where I do not hear of its application; and since I discovered an efficient method of

metallizing the surface of non-metallic substances, even a copper statue may be taken from a plaster of paris mould, in little more time than would be required to deposit the same thickness on a medal."

Mr. Spencer did not patent his discovery, but made at once a free gift of it to his country and the world. Had he patented it, he could not have failed to realize an enormous fortune.

Shame will it be to England if Mr. Spencer is any loser by his liberality. Great are his claims upon it, not only for what he has done, but for what—if enabled to pursue the bent of his genius—he is yet *capable* of doing. Mr. Spencer does not conceal that his "means of cultivating science are limited, the hours it occupies being stolen from those usually set apart for relaxation and rest, *my ordinary avocations being of a laborious nature.*" Millions are now in the course of being lavished on the arts of war, which are arts of destruction and waste. A grant of a few thousands to so successful a contributor to the arts of peace as Mr. Spencer would garland the way, by which the losses of many wars might be repaired.

May not besides, society as it exists in England, owe something to Mr. Spencer in the way of reparation for gross injustice? Is it unlikely that he may have been prevented from securing to himself the benefit of his discovery for the usual patent-right period of fourteen years, by the shamefully enormous cost of a patent? Nay, is it not almost certain, that if he could have secured for fourteen or even any lesser period a right to his discovery, as easy and effectually as he has secured to himself and his assigns a right for his lifetime to the book of "Instructions" now before us, he would have done so? And what claim to public protection can the Author of a *description* of a new art set up, which is at all to be compared with the claim of the *inventor* of the art itself? Mr. Spencer is, we doubt not, but one of many inventors who have been literally defrauded of the fruits of their genius and industry by a most anomalous—most unfair—and most unwise system of legislation.

The cause of the preference given to the empty pretensions of Jacobi in the higher scientific circles of this country is no secret. A common carver and gilder (for Mr. Spencer claims to be nothing more), proposed in the autumn of 1839 to disclose the New Art of which we are now speaking to the Birmingham meeting of the British Association; and had he been allowed to do so, he would have conferred, by his communication, more honour and value on the proceedings of that Association than all besides that it has ever achieved for the arts and sciences since its first existence. But the Association missed the opportunity! The section (of its Wisdom?) to which the proposition was referred, and of which the mouth piece for the season was Dr. Lardner, decided that the communication of the carver and gilder was undeserving of notice! It was positively refused a hearing!!! It seemed absolutely as if they thought nothing worth while, could come from any quarter so lowly and so unpretending! Yet, in spite of the *rejection* by the British Association of the proffered revelation of this important art—in spite of their contumelious treatment of its meritorious discoverer—the art has made its way, and has achieved triumphs which sweep all opposition and all disparagement before it. And therefore do the magnates of the scientific world feel annoyed—irritated—mortified—to the odious degree even of denying the humble carver and gilder any merit whatever! Rather than confess themselves to have been egregiously in the wrong—to have missed an opportunity of exaltation—such as they never had before, and such as may never happen to them again—they would rather transfer to a foreigner of the shallowest pretensions imaginable, all the credit, which is justly and exclusively due to a countryman of their own of the highest genius and attainments!

The Art has been hitherto called *Electrotype;* but Mr. Spencer proposes to give it the name of ELECTROGRAPHY; and we quite agree with our able contemporary, the *Liverpool Journal*, in recognising the right of the first discoverer to designate it as he pleases. Electrography is, besides, the fitter appellation of the two; being at once more distinctive and more comprehensive.

Specifications of Practical Architecture; preceded by an Essay on the Decline of Excellence in the Structure and in the Science of Modern English Buildings, with the Proposal of Remedies for those defects. By ALFRED BARTHOLOMEW, Architect. 8vo. pp. 772, with 160 wood engravings. London, Williams.

The title of this work conveys but an imperfect notice of its contents. The "Essay" which precedes the Specifications occupies above one half of the entire volume, and consists of no less than one hundred and fourteen chapters, which treat not only of the immediate causes of the decline of modern English architecture, but of almost every subject connected with architectural art. Mr. Bartholomew is an enthusiastic lover of his profession, and has studied it well and thoroughly; he has been a shrewd and careful observer; likes to think for himself, and thinks generally very justly; and he has accumulated, in the course of a long and successful practice, a vast deal of most valuable practical information—of all which

excellent qualifications for writing well, the fruit is to be found, in the many-chaptered and very able Essay before us. We have been especially pleased with, and would particularly recommend to the attention of the architectural student, those parts of Mr. Bartholomew's lucubrations in which he traces many of those peculiarities in ancient art, which hasty and uninformed observers are but too apt to regard as the offspring of mere whim and caprice, to a profound sense of utility, or what he calls pure structural taste. A brief quotation or two from his Preface will at once unfold to our readers the scope of Mr. B.'s views on this head.

"The Greeks, from the exercise of judgment, little assisted by their immature science, had their architraves high, massy, and expensive; *this was purely structural.*

"The Romans, having through the advance of science acquired the art of relieving by concealed arches their architraves from superincumbent weight, made these architraves lighter and less massive; *this too was purely structural.*

"A lighter burthen to support led of consequence to a reduction of the bulk of the column. * * *

"I am not less sure that the Pointed Architects having, by a refined philosophy, cut away burdensome crowns from arches, what remained of these materials became of necessity Pointed Arches, and constructively so, although their invention is imagined by the superficial to be merely an affair of taste.

"In Pointed Architecture all is structural, from the boss which confines the arch ribs (radiating from it as the spokes radiate from the nave of a wheel), to the wall buttress, which receives the endings of the vaulting most artfully conducted down the vaulted ribs through the flying buttress, and innoxiously dissipated on the ground itself * * * * * *

"In Pointed Architecture all is structural, from the brazen filleting, which sustains the detached shafts of the early English piers, to the mullions which sustain the glass of the windows, and prevent the storm from blowing it in.

"The modern man of taste would imitate the groined vaults of Pointed Architecture merely because they are groined; but the Freemason groined them because he would so relieve from thrust and weight the window-heads, voids, and other weak parts of a fabric. * * *

"The Freemason spread his rib-work as artfully, in proportion of lightness and tenacity, almost with the daring and success with which the spider spreads his web; while a large portion of modern rib-work is but a parasitical burthen upon vaulting scarcely able to sustain itself."

The Specifications, which are fifty-four in number, are all of the author's own composition, and no less than thirty-two of them are specifications of works which have been actually constructed according to them, under Mr. B.'s own superintendence,—without any "dubious or vulnerable parts" being discovered in them, or any "disputes" having arisen out of them between the builder and the contractors.

An Appendix of Forms is added, and an Alphabetical Abstract and Arrangement of the London Building Act drawn up with great professional tact and skill.

Tyas's National Map of England and Wales, No. 1. Tyas—Weale, Publishers; Jobbins, Engraver.

The National Map, the first number or sheet of which we have now before us, is to be throughout on a uniform scale of one-third of an inch to a mile (half the scale of the still unfinished Ordnance Map); the price of each sheet, however full of labour, is never to exceed one shilling, and many are to be charged only sixpence;' and it is expected that the entire map, embracing fifty-eight sheets, will not cost more than fifty shillings. It is a well-planned and most meritorious undertaking, and can hardly fail of pre-eminent success. Nothing of the sort, at once so cheap and so complete, has ever before been offered to the public; and in point of execution (if we may judge from the specimen before us), it has nothing to fear from comparison even with the great and costly Ordnance Map itself. The present sheet comprises London and its environs, and is to be followed by Surrey, Kent, and Sussex.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM PEIRCE, OF JAMES'S PLACE, HOXTON, IRONMONGER, *for improvements in the construction of locks and keys.*—Enrolment Office, Nov. 2, 1840.

These locks, which are upon Barron's principle, with numerous tumblers, are furnished with a detector, consisting of a sliding bolt acted upon by any one or all of the tumblers; the opposite end of this sliding bolt is jointed to a small lever, mounted on a suitable axis. Within a tube, opposite the lower part of the key-hole, a dart, or sharp-edged punch is placed upon a strong spiral spring; there is a notch on the under side of the dart, in which the detector lever rests and holds the dart down upon the compressed spring. On attempting to open the lock with any but the original key, one or other of the tumblers is over lifted, which, acting on the detector lever, releases the dart or punch which flies out through the key-hole,

wounding the hand that holds the key. The face of the punch being in the form of a letter or figure, inflicts a wound that for several weeks identifies the agressor; these locks have therefore been termed *Identifying Detector Locks*, as noticed at page 314 of our 893rd number.

In order to prevent the accumulation of dirt, &c., within the pipe of the key, a metal stop is fitted so as to work freely within it, being kept flush with the end of the pipe by means of an internal spiral spring, which yields to the pin of the lock when in use.

The claim is,—1st, The mode of constructing detecting locks. 2nd, The mode of applying spring stops to keys.

FRANK HILLS, OF DEPTFORD, MANUFACTURING CHEMIST, *for certain improvements in the construction of steam boilers and engines, and of locomotive carriages.*—Enrolment Office, Nov. 5th, 1840.

These improvements are numerous and difficult to explain without the illustrative engravings; a tolerable idea of their nature, however, will be conveyed by the following list of the ten claims:—

1. The employment of a series of vertical tubes partly filled with water, and having small pipes passing down their centres, forming passages for smoke or heated air.

2. The employment of a series of vertical tubes which are closed and unconnected at the top, and open at the lower end, which communicates with a chamber, or series of chambers, partly filled with water; and which tubes have small pipes passing up their centres, for the purpose of conveying the steam to the boiler with which they are connected.

3. The use of flat chambers connected by means of pipes, filled with water, the upper portion of such chambers forming steam chambers.

4. The employment of wooden felloes to wheels used for locomotive and other carriages, which felloes are enclosed between two vertical wrought-iron rings, to which the spokes of the wheel are welded.

5. The employment of hollow arms, which are open at the ends on which the wheels revolve, and through which opening the driving shaft passes.

6. The employment of collars or enlarged pieces running in bearings, which have a groove and are connected with the brass containing oil, in order that a regular supply may be afforded to the working parts requiring the same.

7. The method of filling up the space between the arms of the (Hero's) engine.

8. The method of reversing the motion of the engine by employing two sets of arms, with other apparatus hereafter described.

9. The mode of inserting a wooden block or other slow conductor of heat between the tube which communicates the motion and the driving shaft.

10. The mode of imparting motion to an engine shaft, by means of an arm or crank being fixed on the middle of such shaft, and driven by one of two connecting rods alternately, which are both driven by the piston rod and guided by radius rods.

HENRY DIRCKS, OF LIVERPOOL, ENGINEER, *for certain improvements in the construction of locomotive steam engines, and in wheels to be used on rail and other ways, parts of which improvements are applicable to steam engines generally.* — Rolls' Chapel Office, November 12th, 1840.

Mr. Dircks claims, first, a novel arrangement and construction of the exhaust or exit pipe by which the waste steam from the cylinders is conducted into the chimney, and is made to act upon the gas, smoke, or heated air at the back end of the fire tubes in very small jets, and thereby to prevent or consume the smoke from the furnace when coal is used. The exit pipe is placed in the smoke box of the engine as usual, but consists of a series of small branching tubes perforated with a number of small holes on the side opposite the fire tubes, so as to cause the waste steam to issue in jets against the ends of the tubes through which the smoke, &c., escapes, and thereby effects its destruction. The second part of this patent refers to the construction of cast or wrought iron wheels for railway purposes, with wood tyre, of which we gave a full description in our 896th number.

The claims are—1, the construction or arrangement of the exhaust or exit pipe, used in combination with tubular boilers, in the manner, and for the purposes set forth. 2, the construction of a metallic wheel with a wooden faced tyre, without being confined to its precise mode of construction or putting together.

RICE HARRIS, OF BIRMINGHAM, GENTLEMAN, *for certain improvements in cylinders, plates and blocks, used in printing and embossing.*—Roll's Chapel Office, Nov. 12, 1840.

This patent is,—1st, for the manufacture of cylinders, plates and blocks made of, or coated with glass, enamel, or other vitrified substances, containing silica, boracic acid, or either of them, sufficient to render such cylinders, &c., capable of being acted upon by hydrofluoric acid, alone or in combination with ammonia, or other base. The cylinders thus produced, being used for printing or embossing of linen, woollen, silk or other similar fabrics. 2nd, the application of tubes or linings for cylinders made of copper, brass, or other expensive materials, for the purpose of economizing those metals. The glass cylinders, &c., are made in the follow-

ing manner: 28 parts (by weight) of clean Isle of Wight sand: 35 parts of red lead: 14 of soda ash: 7 of nitrate of soda: 7 of calcined iron scales: 7 of refined borax: 7 of calcined copper: 7 of oxide of manganese: and 20 parts of pulverised flint glass, are melted together in a large crucible or pot, in a glass furnace. When these ingredients have become fused, and the whole, or nearly the whole, of the volatile gas has been disengaged, the fluid mass is transferred to smaller pots for the convenience of casting. A cast-iron mould, in parts, is provided, its internal diameter being that of the cylinder required, and furnished with an inner core or tube, through which a current of cold water is continually flowing to prevent the fusion of the tube. When the melted glass is poured into the mould, a solid cylindrical piston is forced down upon it by a strong vertical screw, in order to compress and solidify the mass. The cylinder thus formed, is to be annealed in a kiln of the usual kind, by being placed in a case of iron rather larger than the cylinder itself, and surrounded with finely-powdered charcoal; this case is to be suspended within the kiln, so that the cylinder may be uniformly annealed all over. Or, the cylinder may be annealed in the mould in which it was cast. The cylinder is then to be smoothed and polished in the manner usually adopted in glass polishing.

Cylinders, plates, &c. may also be made of other materials, and coated externally with some suitable vitrified substance, capable of being acted upon in like manner by the acid. The cylinder, &c., produced in either of these modes, may be engraved upon the surface in the usual way of engraving glass, or may be etched by treatment with the acid; in the latter case, the parts not to be acted upon are protected by wax or other suitable etching grounds, and the cylinder immersed in hydro-fluoric acid; by this means the pattern, in relief for printing, or sunk if for embossing, is produced upon the surface, and the cylinder being mounted on a mandril or axis, is ready for use. In the formation of metal cylinders upon the plan here patented, tubes or linings of iron, or compressed wood, are put into cylinders of brass, copper, or other suitable metals, thereby reducing the quantity of the more expensive materials. The external brass or copper cylinder has a lining cemented throughout its length, furnished at each end with a screw projecting beyond the cylinder for receiving two caps or nuts, which attach it securely to the cylinder. A rib or feather upon the lining tube fits into a corresponding groove upon the axis or mandril, in the usual way of mounting printing cylinders.

George John Newbery, of Cripplegate Buildings, Manufacturer, *for certain improvements in rendering silk, cotton, woollen, linen, and other fabrics, waterproof.*—Rolls' Chapel Office, Nov. 12th, 1840.

This process consists in the application of drying oils, oil compositions, varnishes, &c. in such a manner, that one side of the fabric, when finished, presents a nearly unaltered appearance, while the other is covered or coated with the composition employed. This is effected by applying siccative or drying oils and compositions, so as that while one surface is dried by any of the usual means, the drying of the other shall be retarded or prevented. Several methods of accomplishing this object are set forth. In the first place, the silk or other material being strained upon a frame is floated on the surface of any suitable siccative compound in a bath of about one quarter or half an inch in depth, when a thin skin or pellicle forms and dries upon the upper surface, while the lower one is prevented from drying by its immersion in the fluid. When this pellicle is quite dry, the silk is removed from the bath, and the oil cleared from its under surface by washing it with spirits of turpentine, which restores the original appearance of the fabric on that side, while the other side remains coated with the waterproof composition.

Another method is to lay the fabric saturated with the oil, &c. upon a slab of stone, slate, metal, or other non-absorbent surface, when a similar effect will be produced. In using oil or oil paints, the time required to form the pellicle depends on the nature of the composition, the state of the weather, &c.; in summer, ordinary boiled linseed oil takes about ten hours to skin over, but this must be ascertained by touching, the drying process being continued until the surface loses its tackiness—i. e., till the pellicle is perfectly formed.

Fabrics prepared with the water-proof compositions may be placed on both sides of horizontal tables; or, in order to economise room, the tables may be set to dry vertically, or at an angle: the composition in that case being thickened with whitening or pipe-clay, to prevent its running. Another plan is to place two pieces of silk, or other fabrics, on stretching-frames, saturate them with the composition, and leave them in close contact; when the pellicles on the exterior surfaces are dry, the two fabrics are to be separated, and the interior surfaces cleaned off with spirit of turpentine as before directed. Another mode is to saturate the fabrics singly, and scrape off the pellicle as it is formed on the one side, leaving it undisturbed on the other. Or, when the inspissated composition is just beginning to set, but is still capable of being washed off, a coat of plain linseed oil, thickened with flour or other suitable body, is laid carefully on

the one surface, while the other is left to dry; when the pellicle upon the unprotected side is hardened, the composition on the opposite surface is washed off with spirits of turpentine.

Another mode is, saturating the fabric with oil paint, that will not dry very readily without the addition of metallic oxides; as, for example, linseed oil. This oil, therefore, is to be thickened with proper pigments, and well brushed over the fabric; the oxide, in an impalpable powder, is then to be sifted over the one surface, which will cause it to dry, when the other can be cleaned off in the usual manner. Or lamp-black mixed with oil, to a buttery consistence, is to be unequally applied to the two surfaces, so that when the thin permanent coating is dry on the one side, the other, being still moist, can be easily removed.

Damask patterns or designs are produced with the compositions, by using plates or blocks in which the pattern is sunk or raised upon them after the manner of blocks for printing calicoes, paper-hangings, &c., which projections cause the drying to take place in the form of the pattern; the other parts of the outline remaining moist, are washed off with spirits of turpentine. Another modification for producing the same effect is by using perforated pattern-plates of card-board, hardened oil-cloth, or other suitable laminated materials, and placing the same against one side only of the fabric, or between two fabrics, on a frame, as before-mentioned. The claim is, first, for the improved modes above described of applying substances to such saturated textures so as to prevent one surface thereof from drying hard, or forming a pellicle thereon, while the other is allowed to do so, by the action of the atmosphere, or by artificial heat, and then cleaning away the moist parts by the agency of spirits of turpentine or other suitable liquid. Secondly, the mode of producing damask patterns or designs on the surface of such fabrics in the way or manner above stated.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for August, 1840.]

Coffins made of Cement, &c. *M. Leonard; July* 2, 1839.—The claim is to the making of coffins of a resinous cement which is to be poured into moulds properly constructed, there being cores of thin boards, perforated, or formed of slats, in such a manner as to cause the cement to bind perfectly, and also to cover the edges of the wood completely. The particular manner of forming these moulds is also claimed.

"My cement, or composition, I make as follows:—I take rosin, beeswax, and pulverised stone, which I incorporate intimately by heat. The stone may be limestone, marble, granite, or any other of a suitable hardness and texture; the pulverised stone I prefer to make of different degrees of fineness, from that of corn-meal to that of grains of buck-wheat. To five pounds of rosin and one of beeswax, I add about thirty pounds of the pulverised stone, first melting the rosin and beeswax in an iron vessel over a fire, and stirring in the pulverised stone, previously sifted; and these ingredients in their proportions, or nearly so, will constitute a cement, or bituminous artificial stone, which, whilst it may be fused and cast into moulds, will, when cold, be extremely hard and tough, and perfectly impervious to air and moisture."

Gas Burners. *G. Darracott and J. Nason; July* 26, 1839.—"The object of our improvements is to render the passages in the burner, through which the gas is conveyed for consumption, more accessible, that the carbonaceous matter which is liable to collect in and obstruct them, may be expeditiously removed."

The claim is to "the method of supplying the burner with gas through any number of straight perpendicular tubes, or apertures, opening into a circular space above, and into a common feeder or reservoir below, which feeder may be taken off at pleasure for the removal of any obstruction which may occur in the said tubes or apertures."

The cylindrical body of the burner has a screw cut on its lower end, by which it is screwed into a bottom or seat, which bottom screws on to the gas tube. Holes are drilled, in a vertical direction, between the openings in the cylindrical body of the burner, through which air is admitted to the interior flame, which holes lead into the annular space below the perforated steel plate for the jets. When this cylindrical body is unscrewed from its seat, any obstructing matter may be readily removed through the said straight holes. The circular space below the jet plate is cut from the solid metal, and the holes are drilled into it from below.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 903.] SATURDAY, NOVEMBER 28, 1840. [Price 3d.

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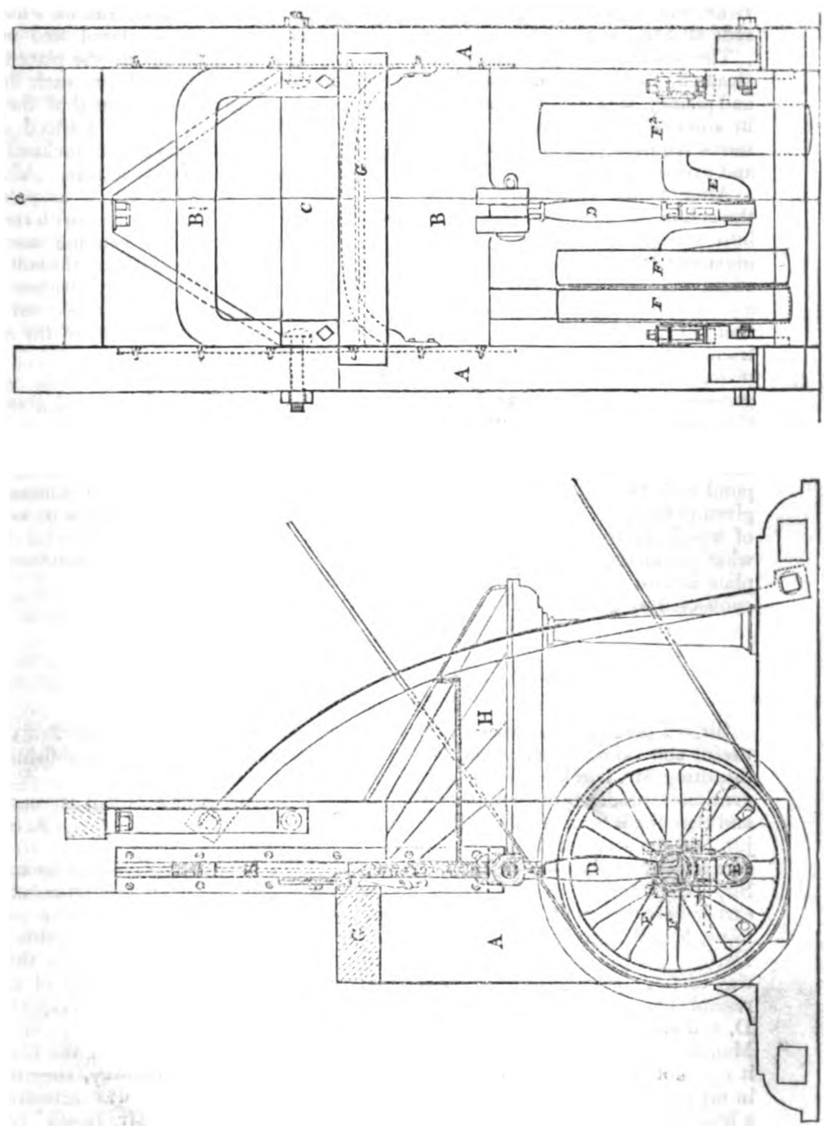


Fig. 1.

Fig. 2

TAYLOR'S IMPROVED STAVE-CUTTING MACHINE.

TAYLOR'S IMPROVEMENTS IN MANUFACTURING STAVES, SHINGLES AND LATHS.

Among the specifications of patents enrolled during the past week, is one by Mr. W. H. Taylor, for a method of forming the staves of casks, shingles and laths, which promises speedily to supersede all hand-work of this description.

The wood to be operated upon, is first steamed, until it acquires such softness and pliancy, that it can be cut or blocked by suitable machinery into the different forms required, with a degree of rapidity and precision, not hitherto attained.

After being sufficiently softened by the action of the steam, the wood is cut into straight rectangular pieces by an ingenious cutting machine shown in the engravings on our front page, fig. 1 being a front elevation, and fig 2, a lateral section through the line *a b*. A A, is the frame of the machine; B B, a strong iron plate, which slides up and down in grooves in the side posts of the frame; C is a straight knife, or cutter, affixed to the front of the sliding plate B, but at such a distance from it as shall correspond with the thickness required to be given to the pieces into which the blocks of wood are to be cut. D is a shaft which connects the bottom of the sliding plate B with the crank E. This shaft is connected by gearing F F[1] with a steam engine or other power, by which a rotary motion is given to the crank, and (through the crank) an alternating vertical motion to the sliding plate B and knife C. F is a fly-wheel; G a platform, on which the block to be cut is placed and pushed forward by hand against the plate B, and under the knife C. Upon each descent of the knife a piece of wood of the exact size determined upon, is sliced off the block, and falls down an inclined shelf H, into a suitable receptacle. After the pieces are thus cut off, if intended for barrel staves, they are forthwith removed to the forming and bending machines, so as to be finished while in the soft state; as it is essential to the perfection of the process that the wood should not be allowed to cool between any of the several operations.

This process, besides being one of great rapidity, is also one of great economy, the operations being conducted with much less waste of material than attends the usual modes of sawing, rending, chopping, adzing and planing. Its application appears to us to be very extensive, and exceedingly useful for all purposes similar to those enumerated by the ingenious patentee.

RAILWAY WHEELS WITH WOODEN TYRES.

"Palmam qui meruit ferat."

Sir,—I perceive a notice in your very useful and valuable periodical, No. 899, disputing Mr. Dirck's priority to the invention of wooden tyre for railway wheels, and claiming it for a Mr. John Rivington, jun., on the score of his having suggested a similar application in 1839. Now, Sir, I beg to put in a claim of much earlier date on behalf of an old friend of mine, Mr. William Frost, Millwright, of Derby. In 1832, he made a model railway carriage-wheel, bearing a very close resemblance to that patented by Mr. D. and submitted it to the Liverpool and Manchester Railway Company, by whom it was not accepted. A model was left in my possession, and though I have had a long search for it with a view to sending it to you, I regret to say I cannot lay my hands upon it. It was, however, *essentially* the same wheel as Mr. D.'s. As an act of justice to Mr. Frost, I request the favour of your publishing this in your next Number.

I am, Sir, your obedient servant,

S. S. S.

Manchester, November 4, 1840.

[We have been favoured by our correspondent with an inspection of some documents, which fully bear out the statements in his letter; with this exception, that though they prove that Mr. Frost sent in 1832, a model of a wheel differing in no material respect from that of Mr. Dirck's, to a certain individual *to be* submitted to the Liverpool and Manchester Railway, they leave it in doubt whether it was actually submitted to them. Mr. Booth, then, as now, the Manager of the Company, could clear up this point, and will, we are sure, be very willing to do so. Ed. M. M.]

NEW METHOD OF DRAWING PARABOLAS.

Fig. 1.

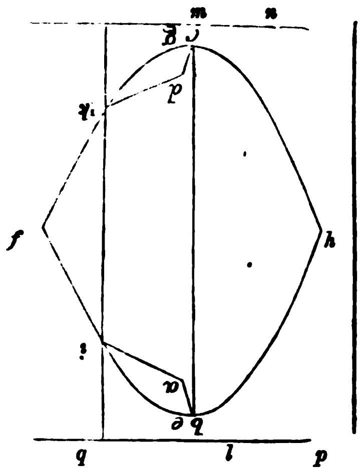
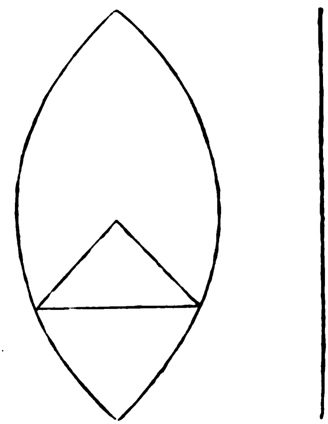


Fig. 2.



Sir,—I take the liberty of sending you the following communication, believing it to contain a new method of drawing a parabola, whereby it is shown to possess two foci like the ellipse, instead of one only, as stated in all works on the subject; to which is added a new definition of a parabola. Should it be deemed worthy, its insertion in the *Mechanics' Magazine* will greatly oblige,

A SUBSCRIBER.

London, October, 1840.

To Draw a Parabola.

Let the lines (fig. 1) *a b, b c, c d,* represent a string with its ends fastened at the points *a* and *d*. If the slack of the string be taken up by two pencils, as at *b* and *c*, so that the distance of *b* from *a* is equal to the distance of *c* from *d*; then if they be moved uniformly from a line joining the points *a* and *d*, in the direction *f*, keeping the string tight, they will describe the semi-parabola *b, f, c*. By moving them in a similar manner in the opposite direction, they will describe the other semi-parabola *e, h, g*.

If, on the same side of the axis, two points be taken in any part of a parabola, equally distant from the vertices, the sum of the lines drawn from them to the foci, added to the line joining each other, will be equal to the distance between the two directrixes.

For let *e f g h* (fig. 1) represent a parabola; *a d* its foci; and *n o, p q,* its two directrixes.

Then, since $a\,i + i\,k = l\,k + k\,i$, and $d\,k + k\,i = m\,i + i\,k$; hence, $a\,i + i\,k + k\,d = m\,i + i\,k + k\,l$.

Hence, the following definition of a parabola:

If two points be given in position, the foci of two points the sum of whose distance from them, added to their distance from each other, is always the same, is a curve called a parabola.

Note.—The above definition will apply to the limiting form of the parabola (fig. 2), for, although it has, in fact, only one point in position, yet that point represents the *foci* of the curve. The two points in position, therefore, in this case, coincide or overlap each other.

ON THE EXPANSION OF AIR BY HEAT UNDER PRESSURE.

Sir,—I should feel obliged if you or any of your readers would inform me what is the increased elasticity or pressure of confined air, when exposed to different temperatures. I have not been successful in finding any such table, but in the first part of the treatise on Heat, Knowledge, I observe a table which gives "the changes of bulk produced upon 100,000 parts of air by every additional degree of Fahrenheit from 32° to 100, and by every additional ten degrees afterwards to 210°," the following are extracts:—

Temperature.	Bulk.
32°	100,000
100	114,144
150	124,544
200	134,944
210	137,024

Now Sir, I must confess that the small expansion, according to this table, surprises me; if I may judge from this I should conceive that the pressure of air under a similar increase of temperature would merely receive a corresponding trifling increase. When a bladder nearly empty, is placed by a fire, it is inflated by the air within being heated; in this common experiment the air increases in bulk much more than the above table would indicate. I should be glad to have this apparent discrepancy explained.

And oblige Sir,

Your obedient servant,

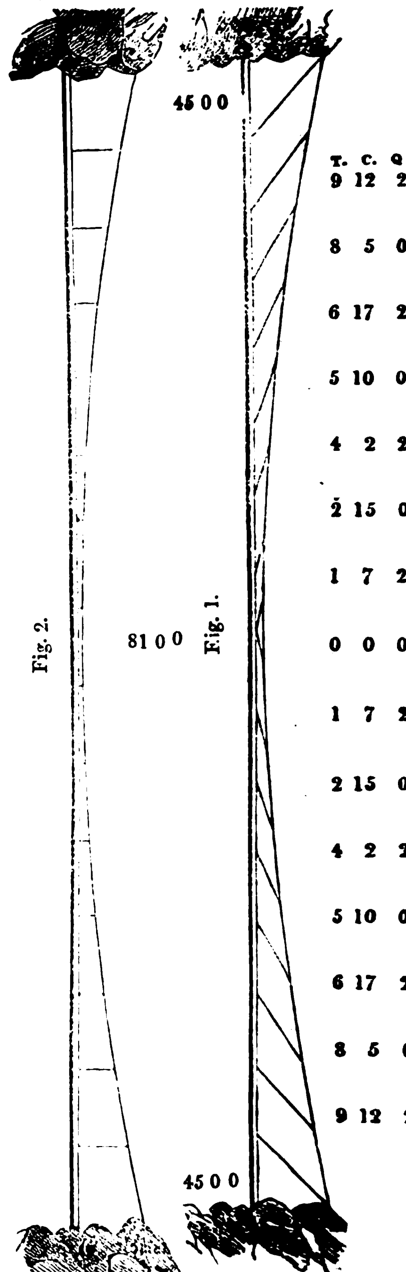
A Reader, B.

London, October 22, 1840.

THE FALLACY OF THE COMMON SYSTEM OF BRIDGE BUILDING EXPLAINED. — BY MR. J. DREDGE, BATH.

Sir,—These figures represent the new and a common suspension bridge, and the strains at various points to which they are exposed by their own weight and position. They are 10 feet deep, 180 feet long each,* and are of equal bases. The ultimate strength of each is 100 tons; the weight of fig. 1 is 6 tons, and that of fig. 2 (as it is the same size throughout) 18 tons. In the former, the strains on the curves at the abutments are only 19 tons 5 cwt., with no central strains or undulation; but in the latter, the strains are 90 tons at the abutments of the curves, also 81 tons at the centre, and the undulation to which it may sometimes be exposed is even more destructive than its weight. Thus, then, the actual strength of fig. 1, for transit use, which is the only object of a bridge, is 80 tons 15 cwt., whilst that of fig. 2 is only 10 tons. Hence the advantages of the former over the latter are *stability and eight times the power, with a third of the materials;* and these are still greater in more extensive bridges.

To find the strains of fig. 1. Rule. Multiply a third of the weight by the length, and divide the product by twice



its depth, to which add the remaining

* Depth is the deflection of the arch—length is the distance between the abutments.

weight. *Example.* $2 \times \frac{180}{20} + 4 = 22$, total 22 tons; from which deduct the support afforded by the first rods nearest the towers, which is $\frac{1}{4}$ in this bridge, the remainder is the amount of strains on the bases of the curves.

To find the strains of fig. 2. Rule. Multiply half the weight by its length, and divide the product by twice its depth; this gives the central strains, to which add the remaining weight for the two abutment strains on the curves. *Example.* $9 \times \frac{180}{20} = 81 + 9 = 90$.

Position is the only distinction between Suspension and Compression Bridges; the curves of the former are below, and those of the latter above their bases; reverse the figures, and the fact is proved; or, see Lord Western's clear explanation of the bracket, in his letter to Lord Melbourne on this subject.* In which position is iron strongest? is a question that deserves the greatest attention. In the perpendicular, which is the most powerful situation of compression, an inch bar 20 feet long is powerless; but on suspension, the same would sustain nearly 30 tons. If tapered, it would sustain its own length 60,000 feet; therefore, spans to 4,000 feet extent can be effected with safety, and the cost of such bridges will be as nothing in comparison with their utility.

The only timber required in the construction of suspension bridges is for the flooring, which can at any time be easily repaired, without interfering with the frame, nor can this be objected to, since we now pitch our streets with wood.

I am, Sir, your humble servant,

JAMES DREDGE.

* See *Mech. Mag.*, vol. xxxii, page 706.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

MILES BERRY, OF CHANCERY-LANE, GENTLEMAN, *for improvements in treating, refining, and purifying oils.*—Petty Bag Office, November 7th, 1840.

Whale oil being heated by steam to 45° (Raumer), a clear solution of chloride of sodium is added, and the whole stirred for twenty minutes, and placed in suitable vats to settle. At the expiration of three days it is drawn off from the sediment, and treated with gallic acid. After another stirring, nitric acid is added (in the proportion of 2 oz. to every 100 lbs.), when it is left to rest until it is perfectly clear and free from smell. The oleine is then separated from the stearine in the following manner: acetate of alumine, nitrate of potash, and chromate of lime, are each added in the proportion of 2 lbs. to every 100 lbs. of oil, previously dissolved in about 5 per cent. of water. The mixture being well stirred, is left to rest for a whole day, when the oleine is separated by filtration through conical felt bags, and the stearine remaining in the bags may afterwards be solidified by pressure.

RICHARD FOOTE, OF FAVERSHAM, WATCHMAKER, *for improvements in alarums.*—Enrolment Office, November 12th, 1840.

These improvements relate to *fire-alarums.* An inverted glass syphon, with the longer leg closed and the short one open, has a quantity of mercury poured in, so as to enclose the air in the upper part of the longest leg; from either end of a balanced lever hang two weights, the one floating on the surface of the mercury in the short leg of the syphon, the other suspended from a guide rod passing through an aperture in a lever connected with a bent spring; a wire passes from this spring to a detent which supports a weight. In the event of fire, the temperature of the apartment becomes raised, and the heat expanding the air contained in the glass tube, the mercury rises and elevates the floating weight, which acting on the spring lever, &c. releases the weight which runs down, and causing a hammer to strike upon a bell gives notice of the fire.

The manner in which this apparatus may be connected with the striking part of an ordinary clock, is also shown in the specification. The claim is, for the mode of letting off an alarum by means of the local heat; also the mode of applying the works of a clock, with a suitable thermometric apparatus for the same purpose.

JOHN DAVIDSON, OF LEITH WALK, EDINBURGH, *for an improved method of preserving salt.*—Enrolment Office, November 12th, 1840.

In order to accomplish this, scale-board or paste-board is coated with oil paint, varnish, or other waterproof composition; when dry it is passed between a pair of rollers, which curls the fabric and facilitates its formation into cylindrical vessels, which are made with a lap joint. Circular discs of wood, of the proper size, are taken to form the top and bottom, being fastened in their places with shellac or other cement. A piece of paper being stuck over the lap joint completes the box, which is then ready for packing of salt, so as to preserve it from the effects of humidity. The claim is for a mode of preserving salt by packing the same in cases of wood, or other material, coated with

oil colour or varnish, so as to resist wet or damp.

James Walton, of Sowerby-Bridge, Halifax, Cloth Dresser, *for improvements in the manufacture of beds, mattrasses, pillows, cushions, pads, and other articles of a similar nature, and in materials for packing.*—Enrolment Office, November 12th, 1840.

These improvements consist, 1st, in a mode of manufacturing or constructing of beds, mattrasses, &c., by an assemblage or combination of elastic air-vessels or cells, either connected together externally, or enclosed within a connected covering, or both. 2ndly, in the application of such elastic air-vessels, either connected or unconnected with each other, to the purposes of packing articles of a delicate or fragile nature. 3rdly, the mode of making air-vessels for the foregoing purposes.

Two modes of making the air-vessels are set forth, in the one case they are filled with compressed air, in the other with air of the ordinary atmospheric density. In the first case, a metallic receiver is charged with compressed air by means of a condensing syringe; at the upper part of the receiver there is a pipe furnished with a stop-cock; a jointed lever, countersunk on the under side, is brought down upon the pipe, a small aperture being made through the lever opposite the centre of the pipe. India-rubber bottles are cut in half and soaked in hot water (100° Fahrenheit) and afterwards in cold, to facilitate their separation into laminæ; the thin sheets thus obtained are placed over the pipe and held down upon it by the lever; upon turning the stop-cock the condensed air pushes the india-rubber up through the aperture in the lever expanding it into a ball. When of the proper size and strength for the required purpose, the ball is tied round with thread close to the lever, the superfluous edges being cut off and the joint secured with india-rubber cement.

Another mode is, having a pair of hemispherical cups hinged together, and both connected by tubes with a metal receiver furnished with a stop-cock, from which all the air is extracted; a piece of thin sheet india-rubber being stretched over the face of these cups, the stop-cock is turned when the external atmospheric pressure presses the india-rubber into close contact with the concave surfaces of the two cups; these are then brought together, and the projecting edges of the india-rubber cut close, when they will adhere together forming a ball. Or a pair of hinged dies is taken having a series of corresponding hemispherical concavities sunk all over their surfaces. Small apertures pass from the bottom of each cavity to the interior of the die, which can be connected with an exhausting apparatus. A sheet of india-rubber being stretched over each surface of the die, the air is exhausted from beneath and the india-rubber forced into all the hemispheres: the dies are then closed with pressure, when a series of balls will be formed connected together by a sheet of india-rubber. In order to prevent adhesion of the interior of the balls, in the event of collapse, finely divided flock or other similar substance may be sifted over the india-rubber while on the dies. the parts where adhesion is required being protected by a stencil plate. The adhesion may also be assisted by the application of india-rubber cement. The sheet of balls thus formed may be advantageously employed for packing any goods of a delicate or fragile nature. Beds, mattrasses, &c., may be formed of layers of the sheets of balls, either with or without a thin sheet of india-rubber placed between each layer, the whole being enclosed within an external air-tight covering, covered with any ornamental fabric. Or cushions and such like articles may be filled with a number of the detached air-balls, in a similar manner.

The advantage of this mode of construction is said to consist in the limitation of an accidental injury or rupture to one small air-vessel; whereas in air-cushions, &c. of the ordinary construction, a small puncture allows all the air to escape, and it is then rendered perfectly useless.

William Hannis Taylor, of Norfolk Street, Strand, Gent, *for certain improvements in the mode of forming or manufacturing staves, shingles, and laths, and in the machinery used for that purpose.*—Enrolment Office, November 18th, 1840.

In order to form wood into any of the articles enumerated, it is first steamed till it is rendered soft and pliant. It is then cut into rectangular pieces, by the machine described elsewhere in the present number; or by revolving cutters affixed to a circular iron plate. If the pieces thus produced are intended for staves, they are passed through a second machine, consisting of a strong wooden table, having an iron plate let into it and firmly secured; two curved knives are screwed to the iron plate with their cutting edges uppermost, and placed one at each side of a rectangular opening in the iron plate and table, but projecting a little over it, so that the hollow space between them shall present the exact form proposed to be given to the staves. A pyramidical block of wood, hollow in the centre serves as a cap or covering to the knives, and is bolted to the table. The rectangular pieces of wood from the cutting machine being dropped two or more at a time into the hollow of the foregoing block, rest on the edge of the knives. A vertical stamper being brought down upon the pieces of wood, causes the knives underneath to cut

them into the form required. The staves being thus formed are passed through a third machine (a screw press) which bends them throughout their breadth and length into the bellied or paraboloidal form necessary for casks, barrels, and other like articles. The time required for passing staves through these three machines is so short, that when completed they are still in a warm state, and it is essential that they should not be allowed to become cold between the several operations.

The claim is—1. The process of steaming the wood of which staves, shingles, or laths are formed, to such a state of softness and pliancy, that it can be cut into the requisite form by suitable machinery. 2. The four different machines described in the specification, whereby the said staves, shingles, and laths, can be formed or manufactured with much greater expedition, at much less expense, and with greater uniformity in point of size and shape, than has been hitherto accomplished.

James Callard Davies, of College-place, Camden-town, Jeweller, *for an improved clock or time-piece.* Rolls' Chapel Office, Nov. 23, 1840.

The improvement consists in the application of a train of watch-work to the fourth or last arbor of a train of clock wheels, whereby a clock or time-piece can be made to go for more than twelve months with once winding up; and also in placing the second or third wheel, or both, of the said train, outside the frame, by which combinations or arrangements a very small and portable clock or time-piece is obtained, only requiring winding once in every year; and having one spring-barrel or moving power to each department thereof, that is to say, one to the going and one to the striking part.

The box or spring-barrel, which is arranged for six revolutions, carries on its circumference a wheel of 140 teeth, taking into a pinion of 10, on a wheel of 110. A third wheel of 90 teeth, although one of the main or body wheels of the time-piece, is not placed within the frame as has always been customary, but is placed outside the front plate, and immediately under the dial of the time-piece, by which means an immense saving of room is effected. A hole is drilled in the front plate, just below the circumference of the second wheel, through which the short pinion of 10, forming the arbor of the third wheel, is brought and secured by a cock. The clock works being thus put together, a portion of watch work (commencing with what is usually termed the "centre wheel") is fixed on the front plate in such a manner that the pinion of 9 teeth, forming the arbor of the first or centre wheel, is driven by the third clock wheel. The situation of the other watch wheels are not described, inasmuch as any ordinary train beginning with the centre wheel, with any escapement whatever, may be made applicable to the purpose, regard being had to the motive power possessed by the third wheel, which from being ascertained as compared with that of the fusee wheel, the "calliper" or size of the watch train to be used must be determined accordingly. Where space is not so much an object, as in clocks for brackets, &c., it may not be needful to adopt the second part of the invention. The claim is—"1st, The application of a train of watch wheels, beginning at the centre wheel as aforesaid, to the arbor acted upon by the third wheel of a train of clock wheels as aforesaid; the centre wheel of the watch train being that which is placed upon the said arbor, and the teeth being arranged as aforesaid, whereby I am enabled to keep the time piece formed thereby, going for more than 12 months with only once winding up. 2ndly. In placing the said second or third wheel of the said clock train, or both, in front of the front plate, or behind the back plate, or at any rate outside the frame, whereby I am enabled greatly to diminish the size of the said clock or time-piece."

NEW PUBLICATIONS.

Tables for the use of Nautical Men, Astronomers, and others, intended principally as Supplementary to the Nautical Almanac and White's Celestial Atlas. By Olinthus Gregory, LL.D.; W. S. B. Woodhouse, Esq., F.R.A.S.; and James Hann, Esq., of King's College. 168 pp. 12mo. Stationers' Company, 1840.

Every person who desires to turn to the best possible account, with the least possible labour, either the *Nautical Almanac* or *White's Ephemeris*, will possess himself of these Tables. A more useful collection for all who "go down to the sea in ships," or whose business it is to teach those who do, can scarcely be imagined. We observe in these Tables a source of error avoided which renders every other set of Nautical Tables we know exceptionable, on account of the deductions requisite to be made for the variations of the Barometer and Thermometer. No such help by mere inspection to "Augmented Refractions" exists elsewhere as is to be found in Table XVIII. of this work, in which the height of the Barometer as diminished by the Thermometer is given even to the tenth of a degree. The names of Gregory, Woodhouse, and Hann—the first of long and well established renown, and the two last of recent yet every-day encreasing reputation—are sufficient guarantees for

the correctness of the Tables; and it is only necessary to give a passing glance at the typography (which we need not say is in tabular work of the first consideration) to be satisfied that they have been admirably seconded by the printers, Messrs. Clowes and Sons. Why is it, may we ask, that the admirable example set by Dr. Bowditch, in the American edition of the *Mecanique Celeste*, of adding the names of the *actual compositors*, has never yet been followed in any English scientific work? Who can doubt that the interests of science and literature, as well as those of the ingenious operative, would be promoted by an extension of the practice?

Hints to Gas Consumers. Second Edition, revised and enlarged. pp. 112. J. W. Parker, West Strand.

When this work originally appeared, we stated our conviction that its author, Mr. J. O. N. Rutter, had performed an essential service both to gas manufacturers and to consumers, by bringing forward in a popular form the information so desirable to be possessed with reference to this illuminating medium. The rapid sale of this little work, the approbation with which it was received, and the frequent enquiries which have been made for it during the few months it has been out of print, have encouraged the Author to prepare another edition. In doing this he has seized the opportunity of carefully revising the whole, and of making several important additions, which from their practical character are calculated to be extensively useful. One chapter of the appendix is devoted to the practices, or rather mal-practices, of gas fitters, with cautions to consumers, against their various schemes of imposition; another chapter treats of the best situation for meters, lights, &c., with a guide to the choice of burners most suitable for different purposes, in which ample justice is done to the patent argand burner of Messrs. Kilby and Bacon, as manufactured by Messrs. Platow and Co., of Hatton Garden, as also to the ingenious gas moderator of the same parties. Every person who either is, or purposes to become a gas consumer, will do well to avail himself of the useful information embodied in these "hints," a careful perusal of which may lead to a great saving of expense, and avert many sources of danger.

PROCEEDINGS OF THE ROYAL INSTITUTION OF CIVIL ENGINEERS.

On the Stamping Engines in Cornwall. By John Samuel Enys, A. Inst. C. E.

"The process of stamping or reducing the ores of tin, in Cornwall, by means of iron stamp-heads, which crush the ore in falling upon it, was formerly effected in mills worked by water power. These have been, from economical and other reasons, for the most part superseded by the use of steam; and, even with inferior engines, the result has been such as to enable the poorer portions of the lode (which were frequently left in the mine) to be now advantageously worked.

"The work performed by the stamping engines was reported with that of the pumping engines, and showed the duty to be from 16 to 25 million lbs. raised one foot high by one bushel of coal, as estimated from the actual weight of the stamp-heads. The engines appropriated for this purpose were generally old double-acting engines of inferior character, and not unfrequently in a bad state of repair. The use of expansive steam was tried with good effect upon them, and induced Mr. James Sims to build an engine calculated more fully to develop the advantages of this principle. He accordingly, in the year 1835, erected one at the Charlestown mines. It was a single-acting engine, communicating the movement direct to the cam shaft for lifting the stampers without the intervention of wheel-work. The first reported duty, in December, 1835, was 43 millions, which was two-fifths more than had previously been performed by stamping engines. Subsequently, Mr. Sims erected other engines of similar construction, and from them may be taken the reported duty in April, 1840:—

Charlestown Mines ..	59,589,884 lbs.
Carn Brae	57,611,073 „
Wheal Ketley........	58,748,452 „

This increased duty induced other engineers to turn their attention to the subject; and they have constructed engines which equal these duties; the chief variation being the adoption of double action, which seems generally to be preferred.

This paper is accompanied by four drawings of the Carn Brae stamping engine, by Mr. Sims, junior, showing in great detail the construction of the engine and the stamping machinery.

On the Effects of the Worm on Kyanized Timber exposed to the Action of Sea Water, and on the use of Greenheart Timber from Demarara, in the same situations. By J. B. Hartley, M. Inst. C. E.

There are probably few ports in England where the inconvenience resulting from the attacks of marine worms (*Teredo navalis*) on the timber of the dock gates and other works exposed to their action, is more severely felt than at Liverpool. The river Mersey has a vertical rise of tide of 27 feet at spring, and 18 at neap tides, and the stream being densely charged with silt, a considerable deposit takes place in the open basins, and to some extent in the docks. The latter are cleansed

by means of a dredging machine; but the former are usually "scuttled," for which purpose sewers connected with the docks surround the basins, having several openings furnished with "clows," or paddles, so that the rush of water from the docks may be applied for clearing away the mud from any particular part of the basin. The security of these paddles is, therefore, of the greatest importance, as the failure of one of them might, by allowing a dock to be suddenly emptied, cause great damage to the shipping. These paddles have been usually constructed of English oak or elm, and being much exposed, they suffer from the attacks of the worms. Cast-iron paddles have been tried; but in consequence of the rapidity of the corrosive action, they soon became leaky, and were abandoned. Kyanized oak timber has been tried on the back of these paddles, and found to be perforated by the worm in the same time as unprepared wood. Some oak planks, two inches and a half thick, Kyanized at the Company's yard, were used on the west entrance gates of the Clarence Half-tide Basin, and in 14 months were completely destroyed. Several similar instances of the non-efficiency of the Kyanized timber are given; and the author proceeds to designate the timber which resists best in such situations. He considers that Teak is less liable to injury than English woods, and instances the inner gates of the Clarence dock, which have been built for 10 years, and at present are but slightly attacked.

The timber which he prefers for dock works is the *Greenheart*. It is imported from Demerara, in logs of 12 to 16 inches square by 25 to 40 feet long, and costs about seven shillings per cubic foot. Of its power to resist the attacks of worms, he gives many proofs; one of them may be cited. At the first construction of the Brunswick Half-tide Basin, several elm clows were placed at the west entrance; these were destroyed by the worms in two years, and were replaced by others made of greenheart; the joints of the plank being tongued with deal, to render them completely water-tight. These clows have now been down about seven years, and, although the deal tongueing has been destroyed by the worms, the greenheart planking remains untouched and perfectly sound.

Many methods of protecting common timber have been tried; but the only successful ones adduced are—1st, the use of broad-headed metallic nails driven nearly close to each other into the heads and heels of the gates, but if driven an inch apart, the worm penetrates between them; and, 2ndly, steeping the timber in a strong solution of sulphate of copper from the Parys copper mines in Anglesea. Some paddles made of English elm thus prepared had been in use upwards of three years, and, on an examination, were found to be very slightly injured; while the unprepared timber about them was quite destroyed.

The author observes, that the outer gates of the wet basins are most injured by the worm, from the sills being low down, and the change of water every tide assisting the growth of the worm. Those parts of the gates which are alternately wet and dry are more injured by the worm than the parts immersed always in the same depth of water. At the spot where a leak occurs from a bad joint, a defect in the caulking, or other cause, the worm commences its attack; so that the most incessant attention is required. Those basins into which the sewers of the town discharge themselves are comparatively free from the worm, from which it would appear that sulphuretted hydrogen gas acts in some measure as a protection against the attacks of the worm.

An Account of the actual State of the Works at the Thames Tunnel (*June* 23, 1840). By M. I. Brunel, M. Inst. C. E.

In consequence of local opposition, the works have not advanced much since the month of March, 1840; but, as that has been overcome, and facilities granted by the City, the works will be speedily resumed, and the shaft on the north bank commenced.

The progress of the Tunnel in the last year has been, within one foot, equal to that made in the three preceding years. During those periods collectively, the extent of the Tunnel excavated was 250ft. 6in., and during the last year the excavation has been 249ft. 6in. This progress has been made in spite of the difficulties caused by the frequent depressions of the bed of the river. These have been so extensive, that in the course of 28 lineal feet of Tunnel, the quantity of ground thrown upon the bed of the river, to make up for the displacement, in the deepest part of the stream, has been *ten times* that of the excavation, although the space of the excavation itself is completely replaced by the brick structure. On one occasion the ground subsided, in the course of a few minutes, to the extent of 13 feet in depth over an area of 30 feet in diameter, without causing any increased influx of water to the works of the Tunnel. The results now recorded confirm Mr. Brunel in his opinion of the efficiency of his original plan, which is "to press equally against the ground all over the area of the face, whatever may be the nature of the ground through which the excavation is being carried." The sides and top are naturally protected; but the face depends wholly for support upon the poling boards and screws. The displacement of one board by the pressure of the ground might be at-

tended with disastrous consequences; no deviation therefore from the safe plan should be permitted.

The paper is accompanied by a plan, showing the progress made at different periods. It is stated that a full and complete record of all the occurrences which have taken place during the progress has been kept, so as to supply information to enable others to avert many of the difficulties encountered by Mr. Brunel in this bold yet successful undertaking.

EXPERIMENTS WITH LOCOMOTIVE ENGINES, ON THE HULL AND SELBY RAILWAY.

(From the *Leeds Mercury*.)

On Tuesday, the 10th instant, a course of five days' experiments commenced with the engines of the above railway, originating through the following circumstances:—

About the commencement of the present year, six engines somewhat similar to those on the Leeds and Selby line, were in greater or less state of forwardness for the Hull and Selby Railway, at the works of Messrs. Fenton, Murray, and Jackson, of this town, when the Hull and Selby Railway Company resolved to have six other engines, on the most approved construction which experience up to that period could produce, from the previous working of locomotives on the various railways. Four objects were particularly kept in view, namely, *safety*, *simplicity*, *accessibility* of the various parts, and *economy*, the whole combining general *efficacy* and *durability* of the engine throughout.

The first object is secured by giving a more extended *base* for the action of the springs in supporting the weight of the engine, being about six and a-half by eleven feet, whereby a remarkably steady motion is seeured at thirty miles per hour. It is not at all a matter of surprise that the four wheel engines of several railways now in use should now and then go off the road, and in an instant, when it is recollected the extreme base of their springs for supporting the engine is only about three and three quarters by about six feet; hence their rocking, serpentine, and pitching motion, which without any other cause than a slight increase of speed, literally lifts the flanges of the wheels above the surface of the rails, and in three or four seconds the engine is turned end for end, upset in the act, and the train with it; whilst the stability of the engine is effectually secured through an extended base upon the front and hind wheels. By means of a new combination the best properties of the four-wheeled engines are also completely applied, by resting the weight on the crank-shaft immediately within the wheels, which experience has for years proved to be the least likely to injure it, and thereby avoid the alarming accidents which have so often taken place by the breaking of the shaft, through placing the weight on bearings outside of the wheels; the centre of the engine being a sort of neutral axis, there is very little power over its motion in that part, and this advantage, by placing the weight on the crank inside the wheels, is in consequence got without a sacrifice of stability.

2ndly. In addition to the safety and simplicity of having only *two* inner frames, instead of three or four, with as many bearings on the crank shaft, the space under the boiler is still further stripped of machinery by a new valve motion, which gives a high degree of openness and facility of access so desirable in examination, cleaning, &c., of the working parts.

3rdly. The steam being used expansively by the valve motion above alluded to, a great saving in fuel is effected, as will be seen on examining the results of the experiments; and as the excessive wear and tear of locomotive boilers arises from intense heat, it is not improbable this decided step towards removing the cause will prevent the effect, namely, the rapid destruction of the boiler. The action of this valve motion is perfectly smooth, being worked by eccentrics (which are also of an improved construction), and any quantity of steam from 25 to 90 per cent. on the stroke can be admitted into the cylinders with the most ready and complete control, at any speed the engine may be going; if a high wind or an incline oppose the progress of the engine, a greater quantity of steam is admitted; if wind or gradients be favourable, the steam is still admitted at full pressure into the cylinders, but shut off at an earlier period, propelling the pistons the remainder of the stroke by its elastic force, similar to driving a time-piece by the uncoiling of the main-spring.

Lastly. A combination of dimensions and proportions have been gleaned from the best results of locomotive engines of various constructions, and in use in different parts of the country. The driving wheels are 6 feet diameter, length of the stroke 2 feet, diameter of cylinders 12 inches, inside dimensions of fire-box 3 by 3½ feet, tubes 94 in number by 9½ feet long and 2 inches diameter. The general diminution of machinery in the construction has given room for ample dimensions in the principal working parts, and thus the whole arrangement has a close bearing on *safety*, *simplicity*, *accessibility*, and *economy*.

Circumstances led to those engines being ordered of Messrs. Shepherd and Todd, Railway Foundry, of this town. The Hull and Selby line was opened with the engines of

the former order, but the public and the Company being so much annoyed by hot cinders from their chimneys, burning whatever they lighted upon, and rapidly destroying the smoke-boxes themselves, three of those engines were altered, and succeeded to a considerable extent in diminishing the nuisance, whilst the engines performed better, and with less fuel. That fact, however, being questioned, and two engines of the *improved* construction having got to work, Mr. John Gray, the engineer of the locomotive department, and patentee of the improved engines, urgently requested a most rigorous and simultaneous trial of the different engines, and to be witnessed for the parties concerned by persons above suspicion. Mr. J. Miller and Mr. T. Lindsley represented Messrs. Fenton, Murray, and Jackson; Mr. J. Craven and Mr. J. Barrons represented Messrs. Shepherd and Todd; and Messrs. E. Fletcher, W. B. Bray, J. G. Lynde, jun., J. Farnell and J. Gray, were the representatives of the Hull and Selby Railway Company. The arrangements for the experiments were, that the gross load should include engine, tender, carriages, and everything in the train.

The steam was got up in the respective engines to the pressure of from 56 to 66 lbs. per square inch; the fires filled to a certain level at the starting in the morning, and filled to the same level on finishing the last trip at night. The pressure of steam at starting was generally up to 66 lbs., and was at about half that pressure at the end of each trip. There were *fifty* experimental trips made in all, namely, 24 trips with the *Collingwood*, *Andrew Marvel*, and *Wellington*, the unaltered engines of Messrs. Fenton, Murray, and Jackson. Their average gross load was 53.4 tons, or 1,656 tons, over one mile: consumption of coke 1,013 lbs. or 0.611 lbs. per ton per mile; water 6,500 lbs. or 3.90 lbs. per ton per mile. There were 10 trips made with the other three engines of Messrs. Fenton, Murray, and Jackson, which were altered at Hull, namely, the *Exley*, *Kingston*, and *Selby*. Their average load was 49.16 tons, or 1,524 tons over one mile; consumption of coke 635 lbs. or 0.416 lbs. per ton per mile; water 4,264 lbs. or 2.79 lbs. per ton per mile.

The *patent* engines made by Messrs. Shepherd and Todd, viz. the *Star* and *Vesta*, made 16 trips, and their average loads, &c., were 55.4 tons, or 1,718 tons over one mile; coke consumed, 465 lbs. or 0.271 lbs. per ton per mile; water 2,874 gals. or 1.62 lbs. per ton per mile. The average gross load of all the 50 trips is 53.2 tons, or 1,649.4 tons over one mile, and taking that as a standard load, the consumption of fuel and water performing exactly equal quantities of work, is represented in the following tables:—

Class of Engine.	Load in tons conveyed over one mile.	Elsecar Coke used per trip of 31 miles in lbs.	Coke used per mile in lbs.	Coke used per ton per mile in lbs.	Water used per trip of 31 miles, in lbs.	Water per mile in lbs.	Water per ton per mile in lbs.
Patent	1649.4	446.98	14.41	0.271	2672	86.19	1.62
Altered	1649.4	686.15	22.13	0.416	4601.8	148.43	2.79
Unaltered ...	1649.4	1007.78	32.59	0.611	6432.6	207.5	3.90

The financial annual result of the three classes of engines for coke and boilers, with such a traffic as that of the Hull and Selby line, will be about—

4,500*l.* for the unaltered engines.
3,250*l.* for the altered do.; and about
2,000*l.* for the patent engines.

In conclusion, it is deserving of remark, that *all* the attesting witnesses expressed themselves highly satisfied with the manner in which the experiments had been conducted, and with the facilities which the Company so readily granted to enable them to come at correct results. Probably no experiments were ever made under similar circumstances where the parties concerned displayed greater independence, impartiality, and good feeling, than on the present occasion.

THOUGHTS ON THE CASTING OF STATUES IN METAL. BY SIR J. ROBISON, F. R. S. E.

[The eligibility of adopting cast iron as a material for the construction of ornamental statues having recently been rediscussed in some of the public journals, an esteemed correspondent has suggested to us the propriety of reprinting the following able paper upon that subject, from the "Edinburgh New Philosophical Journal," for April, 1833—a suggestion which we readily comply with, as the remarks of the writer are deserving of a much more extensive circulation than could be afforded by the work in which they originally appeared.—ED. M. M.]

"When we consider in a superficial manner the comparatively small number of ancient bronze statues which have reached our times; or read the animated, though somewhat ludicrous account given by Benvenuto Cellini, of the obstacles he encountered in casting the statues of Perseus;* and when we advert to the large sums required in the present day for casting works of art in bronze, we are at first apt to imagine that the great cost of such works must be the consequence of some mysterious difficulty in the process; but if we go on to examine more closely into the grounds upon which this opinion is founded, we begin to perceive the anomaly of any such difficulty being supposed to exist in this country, where immense works have been executed in cast metal, works requiring a rigid accuracy of ultimate dimensions not at all necessary in statuary, in which, if the relative properties be truly kept, no injurious effect is produced by the shrinking of the metal which takes place in cooling.†

"On further consideration we are compelled to admit, that where skilful founders and capacious furnaces abound in every district where the most intricate castings are daily and hourly made in masses varying in weight from a few grains to many tons, the difficulty, *if any really exist*, should not be sought for in the moulding pit of the founder.

"The question then comes to be asked, what is the reason that we see so few great statues in metal, and why are modern ones so costly in their execution? We apprehend, the true reply is, that bronze, the material usually employed in statuary is dear; and that as casting in bronze is not a common operation, furnaces have to be erected, and workmen collected, at a great expense for each separate occasion.

"If it be allowed that these are the principal causes of the comparative rarity, and of the great cost of bronze statuary, it is surely worth enquiring, whether, by employing cast iron instead of bronze, we may not materially diminish the cost; and whether, if in making this substitution, there be any thing likely to arise to counterbalance the advantage which we should gain from the great saving of expence.

"In employing iron as the material instead of bronze, we should make a double profit. *First:* From the cost of one metal being about a twentieth part of the other; and, *secondly*—from the circumstance, that, in the immediate vicinity of most places where such castings would be required, foundries would be ready with numerous workmen fully competent to undertake more difficult tasks than would have baffled Cellini with the aid of the driest fire wood which Florence could have furnished him.*

"One component part of the price of an original statue still remains to be adverted to. We mean the remuneration to the artist who designs the model, and superintends the moulding. This every lover of the fine arts would wish to be liberal; but when the aggregate expense is unnecessarily great, and when the sculptor is forced to assume the (to him) foreign employment of a brass founder, he may often be obliged to sacrifice a portion of what he would be entitled to expect as the reward of his talent or the recompence for the risk and anxiety he is made to undergo.

"If, by adopting a cheaper material, and a less expensive method of casting, we should succeed in greatly reducing the cost of statuary, we could more easily afford a liberal remuneration to the genius of the sculptor, the natural consequences of which would be, that more talent would be called forth, and the public places of our cities would soon be enriched by numerous works of art; perhaps we should by degrees come to vie even with those countries whose more favourable climates have led to a greater developement of talent in this branch of the arts than we have hitherto been able to boast of manifesting.

* Cellini's difficulties must have arisen from want of power in his furnace, as he says he overcame them by debasing his bronze with pewter, and by getting some well-dried firewood from a neighbour.

† The casting of a cylinder for a steam engine of 200 horse-power is a more delicate operation than that of a group of statuary; an air hole or flaw which might be imperceptible, is easily repaired in the statue, but would be fatal to the other, though it might not be discovered till great expense had been incurred in finishing it.

* Where fuel is scarce, and of inferior quality, artists will necessarily prefer that metal of which they can accomplish the fusion. If the Greeks or Romans had possessed pit-coal and iron, they would probably have used them in their foundries; having only wood they used bronze. The Dutch who have turf for fuel, make statues of lead, while the Belgians, having coal mines, are now making them of iron.

"It will perhaps be objected by some persons, that iron is too mean a material to be used in the higher classes of statuary, but we apprehend that this is a prejudice which will yield on a little reflection. We do not think iron is too mean to form the mainspring of a chronometer, the sabre-blade of a hussar, or the sword hilt of a courtier, in which latter form we learn from Mr. Babbage it has encreased its original value 973 times.* If fitness for the end be the criterion we are to judge by, and if iron be susceptible of taking a sharper impression from a mould than bronze (which no one can doubt who examines the Berlin and other similar castings), we are bound to admit that, in this respect at least, it is a better material for doing justice to the model of the artist. We may then proceed to inquire whether there be anything in the nature of the metal to make it likely to be less durable than bronze.

"In one material point, iron statues must have the advantage, as the labour which would be required to overthrow and break up a large figure, would scarcely be repaid by the price obtainable for its fragments; while the experience of ages shows us, that the marketable value of bronze affords an irresistible temptation in times of popular tumult; and that gods and goddesses, when made of that material, are not always immortal.

"If danger be apprehended from the liability of the surface of iron to deteriorate by oxidation, we would say, that there is not much difference in this respect between bronze and *cast* iron, and that if the same means be taken to prepare and preserve the surface of an iron statue, as is usual with a bronze one, the weather would make little impression on it. We see around us examples of coarse castings, to the preservation of which little or no attention has been paid, and in which no sensible degradation of the surface has taken place, even in long periods of time. It may, therefore, be fairly inferred, that by the exercise of a little skill, and of a moderate degree of attention, the external appearance of a grand work of art in iron may be made pleasing to the eye of taste, and may be preserved uninjured for generations.

"If we be not greatly mistaken in the effects which must flow from the late improvements in the smelting of iron ore, which have been introduced in some of the furnaces on the Clyde, cast iron of the finest quality for such purposes will soon be so cheap that we shall see it largely employed in architectural decoration. We should take advantage, therefore, of the means which nature and art have so liberally bestowed on us; and we should strive to make Britain as distinguished for her display of the fine arts as she has hitherto been for her success in the mechanical ones."

LIST OF DESIGNS REGISTERED BETWEEN OCTOBER 22ND AND NOVEMBER 23RD.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Oct. 28	443	J. Jones	Lamp	3 years.
"	444	J. Ridgway	A plate	1
30	445	W. and H. Hutchinson	Tube	3
"	446	W. Hancock	Drawer knob	1
Nov. 2	447	M. Platow	Gas burner	3
"	448,9	J. and J. Walker	Cantoon	1
4	450	W. Hancock, jun.	Flesh brush or glove	1
"	451	T. Selby	Tobacco box	3
5	452	Woodward, Gandell and Co.	Carpet	1
9	453	T. Nicholson, and J. E. Hoole	Stove	3
"	454	G. Wheeler	Pencil case	3
"	445,6	S. T. Barr	Hand bill	1
11	457	Kiteley and Fawcett	Carpet	1
12	458	J. Cartwright	Thrashing-machine drum	3
13	459	Carron Company	Stove	3
"	460,476	Wilcoxon and Sons	Stained paper	1
16	477	J. Rostron	Cantoon	1
17	478	J. Hiles	Carpet	1
"	479	Broadhead and Atkin	Coffee pot	3
"	480	Ditto Ditto	Jug cover	3
"	481	W. Blews	Candlestick	3
"	482	Imray and Fitch	Almanack	1
18	483	Mitchell and Son	Envelope	1
23	484	Butler, Brothers	Coffin plate	3

* Many of those beautiful miniature statues in French clocks, which we consider as bronze *dorés*, are, in point of fact, made of cast iron; but as the gold cannot be applied by amalgamation as in the case of bronze, the iron ornaments may be detected by their inferior appearance of the gilding.

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 22ND OF OCTOBER AND THE 26TH OF NOVEMBER.

John Duncan, of Great George-street, Westminster, gent., for improvements in machinery for cutting, reaping, or severing grass, grain, corn, or other like growing plants or herbs. (A communication.) November 2; six months.

Elijah Galloway, of Manchester-street, engineer, for improvements in propelling railroad carriages. November 2; six months.

Josiah Pumphrey, of New-town-row, Birmingham, brass founder, for certain improvements in machinery to be employed in the manufacture of wire hooks and eyes. November 2; six months.

Henry Wimshurst, of Limehouse, ship builder, for improvements in steam vessels in communicating power to propellers of steam vessels and in shipping and unshipping propellers. November 2; six months.

James Heywood Whitehead, of Royal George Mills, York, manufacturer, for improvements in the manufacture of woollen belts, bands, or driving straps. November 2; six months.

James Boydell, jun., of Cheltenham, for improvements in working railway and other carriages, in order to stop them, and also to prevent their running off the rails. November 2; six months.

John Edward Orange, of Lincoln's-inn, Old-square, Captain in the 81st Regiment, for improvements in apparatus for sewing ropes and cables with yarn. November 2; six months.

Herman Schroeder, of Surrey-cottage, Peckham, broker, for improvements in filters. (A communication.) November 2; six months.

John Wordsworth Robson, of Wellclose-square, artist, for certain improvement or improvements in water closets. November 2; six months.

Richard Farger Emmerson, of Walworth, gent., for improvements in applying a coating to the surface of iron pipes and tubes. November 3; six months.

John Rapson, of Limehouse, millwright, for improvements in paddle wheels for propelling vessels by steam or other power. November 3; six months.

Henry Hind Edwards, of Nottingham-terrace, New-road, engineer, for improvements in evaporation. November 5; six months.

Pierre Mathew Mannoury, of Paris, but of Leicester-square, gent., for improvements in wind and stringed musical instruments. (A communication.) November 5; six months.

George Gwynne, of Duke-street, Manchester-square, gent., for improvements in the manufacture of candles and in operating on oils and fats. November 5; six months.

George Dacres Paterson, of Truro, esq., for improvements in curvilinear turning; that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning. November 5; six months.

John Clarke, of Islington, Lancaster, plumber and glazier, for an hydraulic double-action force and lift pump. (A communication.) November 5; six months.

Charles Joseph Hullmandel, of Great Marlborough-street, lithographic printer, for a new effect of light and shadow imitating a brush or stump drawing, or both combined, produced on paper, being an impression from a plate or stone prepared in a particular manner for that purpose, as also the mode of preparing the said plate or stone for that object. November 5; four months.

Henry Kirk, of Blackheath, gent., for improvements in the application of a substance or composition as a substitute for ice for skating and sliding purposes. November 5; six months.

George Delianson Clark, of the Strand, gent., for an improved method of purifying tallow fats and oils for various uses, by purifying them and depriving them of offensive smell, and by solidifying such as are fluid, and giving additional hardness and solidity to such as are solid, and also by a new process of separating stearine or stearic acid from the oleine in such substances. (A communication.) November 5; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gent., for a machine or apparatus to be used on a moveable observatory or telegraph, and as a moveable platform in erecting, repairing, painting, or cleaning the interior and exterior of buildings, and also as a fire-escape. (A communication.) November 5; six months.

Andrew Kurtz, of Liverpool, manufacturing chemist, for a certain improvement or certain improvements in the construction of furnaces. November 5; six months.

George Halpin, jun., of Dublin, civil engineer, for improvements in applying air to lamps. November 7; six months.

William Crofts, of New Radford, Nottingham, machine maker, for certain improvements in machinery for the purpose of making figured or ornamented bobbin net or twist lace and other ornamented fabrics, looped or woven. November 7; six months.

Charles de Bergue, of Blackheath, gent., for improvements in machinery for making reeds used in weaving. (A communication.) November 7; six months.

Edward Dodd, of Kentish-town, musical instrument maker, for improvements in piano fortes. November 7; six months.

George Edmund Donisthorpe, of Leicester, machine maker, for certain improvements in machinery or apparatus for combining and preparing wool and other textile substances. November 7; six months.

John Joseph Mechi, of Leadenhall-street, cutler, for improvements in apparatus to be applied to lamps, in order to carry off heat and the products of combustion. November 10; two months.

Thomas Lawes, of Canal-bridge, Old-Kent-road, feather factor, for certain improvements in the method or process and apparatus for cleansing and dressing feathers. November 10; six months.

William M'Kinley, of Manchester, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics. November 10; six months.

Charles Edwards Amos, of Great Guildford-street, Borough, millwright and engineer, for certain improvements in the manufacture of paper. November 10; six months.

Thomas William Parkin and Elisha Wylde, of Portland-street, Liverpool, engineers, for an improved method of making and working locomotive and other steam engines. Nov. 12; two months.

Eugenius Birch, of Cannon-row, Westminster, civil engineer, for improvements applicable to railroads, and to the engines and carriages to be worked thereon. November 12; six months.

John Heaton, of Preston, overlooker, for improvements in dressing yarns of linen or cotton, or both, to be woven into various sorts of cloth. November 12; six months.

Otto C. Von Almonde, of Threadneedle-street, merchant, for improvements in the production of Mosaic work from wood. (A communication.) November 12; six months.

Charles Dod, of Buckingham-st., Adelphi, gent. for certain methods or processes for the manufacture of plate glass, and also of substances in imitation of marbled stones, agates, and other minerals, of all forms and dimensions, applicable to objects both of use and ornament. (A communication.) November 12; four months.

Charles Wye Williams, of Liverpool, civil engineer, for certain improvements in the construction of furnaces and boilers. November 17; six months.

Joshua Shaw, of Goswell-street-road, Old-street, artist, for certain improvements in discharging Ordnance muskets, fowling pieces, and other fire arms. November 17; six months.

Joseph Whitworth, of Manchester, engineer, and John Spear, of the same place, gent., for certain improvements in machinery tools, or apparatus for cutting and shaping metals or other substances. November 17; six months.

James Deacon, of St. John's-street-road, gent., for improvements in the manufacture of glass chimneys for lamps. November 19.

Alexander Stevens, of Manchester, engineer, for certain improvements in machinery or apparatus to be used as a universal chuck for turning and boring purposes, which said improvements are also applicable to other useful purposes. November 19; six months.

William Henson, of Allen-street, Lambeth, engineer, for improvements in machinery for making or producing certain fabrics with threads or yarns, applicable to various useful purposes. November 19; six months.

John Cox, of Ironmonger-lane, civil engineer, for certain improvements in the construction of ovens applicable to the manufacture of coke and other purposes. November 21; two months.

John Wakefield, of Salford, hat manufacturer, and John Ashton, of Manchester, hat manufacturer, for certain improvements in the manufacture of hat bodies. November 21; six months.

William Henry Hutchins, of Whitechapel-road, gentleman, and Joseph Bakewell, of Brixton, civil engineer, for improvements in preventing ships and other vessels from foundering and also for raising vessels when sunk. November 21; six months.

Francis Pope, of Wolverhampton, engineer, for improvements in detaching locomotive and other carriages. November 24; six months.

John Haughton, of Liverpool, clerk, M.A., for improvements in the means employed for preventing railway accidents resulting from one train overtaking another. November 24; six months.

Henry Bailey Webster, of Ipswich, surgeon in the Royal Navy, for improvements in preparing skins and other animal matters for the purpose of tanning and in the manufacture of gelatine. November 25; six months.

Charles Grillett, of Hatton-garden, for new modes of treating potatoes in order to their being converted into various articles of food and new apparatus for drying applicable to that and other purposes. (A communication.) Nov. 25; six months.

Henry Walker Wood, of Chester-square, gent., for an improvement in producing an uneven surface in wood and other substances. (A communication.) November 25; six months.

Junius Smith, of Fen-court, Fenchurch-street, esq., for certain improvements in furnaces. November 25; six months.

Frederick Theodore Philippi, of Bellfield-hall, Lancaster, calico printer, for certain improvements in the art of printing cotton, silk, and other woven fabrics. November 25; six months.

Nathaniel Batho, of Manchester, engineer, for certain improvements in machinery tools or apparatus for planeing, turning, boring, or cutting, metals and other substances. Nov. 25; six months.

Thomas Barratt, of Somerset, for improvements in the manufacture of paper. November 25; six months.

Henry Charles Daubeny, of Boulogne, Esq., for an improvement in making and forming of paddle-wheels, for the use of vessels propelled in the water by steam or other power, and applicable to propel vessels and mills. November 25; six months.

James Lee Hannah, doctor of medicine, of Brighton, for an improvement, or improvements in fire escapes. November 25; six months.

Oliver Louis Reynolds, of King-street, Cheapside, merchant, for certain improvements in machinery for producing stocking fabrics, or frame-work-knitting. November 25; six months.

Robert Roberts, of Bradford, Manchester, blacksmith, for a new method or process for case-hardening iron. November 25; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM 22ND OF OCTOBER TO 21ST OF NOVEMBER, 1840.

Thomas Smedley, of Holywell, Flintshire, gentleman, for certain improvements in the manufacture of tubes, pipes, and cylinders. Sealed; October 27.

George Hicks, of Manchester, agent, for an improved machine for cleaning or freeing wool and other fibrous meterials of burs and other substances. October 27.

Miles Berry, 66, Chancery Lane, Middlesex, for certain improvements in the arrangement, construction, and mode of applying certain apparatus for propelling ships and other vessels. (A communication.) October 29.

Edmund Rudge, Jun., of Tewkesbury, Gloucester, tanner, for a new method or methods of obtaining power for locomotive and other purposes, and of applying the same. November 2.

Benjamin Hick, Jun., of Bolton le Moors, Lancaster, engineer, for certain improvements in regulators or governors, for regulating, or adjusting the speed or rotary motion of steam engines, water wheels and other machinery. November 3.

John Coudie, manager of the Blair iron works, Dalry, in the county of Ayr, in Scotland, for improvements in applying springs to locomotive and railway, and other carriages. November 4.

Luke Hebert, of Birmingham, Warwick, solicitor of patents, for improvements in the manufacture of coffered spades and shovels, soughing and grafting tools. (A communication,) November 4.

Arthur Wall, of Bermondsey Wall, Surrey, surgeon, for a new composition for the prevention of corrosion in metals, and for other purposes. Nov. 5.

James Heywood Whitehead, of the Royal George Mills in Saddleworth, York, manufacturer, for improvements in the manufacture of woollen belts, bands or driving straps. November 6.

Samuel Wilkes, of Darleston, Suffolk, iron founder, for improvements in the manufacture of vices. November 6.

Joseph Bennett, of Turnlee, near Glossop, Derby, cotton spinner, for certain improvements in machinery for cutting rags, ropes, waste, hay, straw, or other soft or fibrous substances, usually subject to the operation of cutting or chopping, part of which improvements are applicable to the tearing, pulling in pieces, or opening of rags, ropes, or other tough materials. November 9.

Charles Payne, of South Lambeth, Surrey, gentleman, for improvements in salting animal matters. November 11.

Henry Hind Edwards, of Nottingham Terrace, New Road, Middlesex, for improvements in evaporation. (A communication.) November 11.

Elijah Galloway, of Manchester-street, Middlesex, engineer, for improvements in propelling railroad carriages. November 11.

Nathan Defries, of Paddington-street, Middlesex, engineer, for improvements in gas meters. November 11.

Henry Holdsworth, of Manchester, Lancaster, cotton spinner, for an improvement in carriages used for the conveyance of passengers on railways, and an improved seat applicable to such carriages, and to other purposes. November 11.

Joseph Whitworth, of Manchester, Lancaster, engineer, for improvements in machinery, or apparatus for cleaning and repairing roads or ways, and which machinery is also applicable to other purposes. November 16.

Samuel Wilkes, of Darlington, Suffolk, iron founder, for improvements in the manufacture of hinges. November 17.

Thomas Horne, of Birmingham, Warwick, brass-founder, for improvements in the manufacture of hinges. November 18.

James Smith, of Deanston Works, in the parish of Kilmadock, Perth, cotton spinner, for improvements in the preparing, spinning, and weaving of cotton, silk, wool, and other fibrous substances, and in measuring and folding woven fabrics. Nov. 19.

Benjamin Winkles, of Northampton-street, Islington, Middlesex, steel and copper-plate manufacturer, for certain improvements in paddle and water wheels. November 19.

Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, civil engineers, for certain improvements in locomotive and other steam-engines in respect of the boilers, and the conveying of steam therefrom to the cylinders. Nov. 20.

Peter Bradshaw, of Dean, near Kimbolton, Bedford, gentleman, for improvements in dibbling and drilling corn, seeds, plants, roots, and manure. November 20.

LIST OF IRISH PATENTS GRANTED FOR NOVEMBER, 1840.

F. Hills, for certain improvements in steam-engines, steam boilers and locomotive carriages.

J. Johnston, for a new method (by means of machinery) of ascertaining the velocity of, or the space passed through by ships, vessels, carriages and other means of locomotion, part of which is also applicable to the measurement of time.

R. G. Ranson and S. Milbourn, for improvements in the manufacture of paper.

C. Wheatstone and W. F. Cook, for improvements in giving signals and sounding alarms at distant places by means of electric currents.

R. Beard, for improvements in the apparatus for taking or obtaining likenesses and representations of nature, and of drawings and other objects.

D. Edwards, for improvements in preserving potatoes and other vegetable substances.

Thomas Milner, for certain improvements in boxes, safes, or other depositories for the protection of papers or other materials from fire.

Thomas Clark, for certain improvements in the construction of locks, latches, and such like fastenings, as applicable for securing doors, gates, windows, shutters, and such like purposes.

NOTES AND NOTICES.

Rock Crystal Spun.— M. Gaudin sent to the Academy of Sciences, at the last (April) session, specimens of rock crsytal, which he had succeeded in melting and drawing out into threads several feet in length, with the greatest ease. One of these can be wound into a skein, and the other wound round the finger. M. Gaudin has found also, that melted rock crystal moulds easily by pressure, and that it is very volatile at a temperature a little above its melting point. Alumina acts very differently from silica; it is always perfectly fluid, or crystalized, and cannot be brought to a state of viscosity; while viscosity, separate from all tendency to crystalization, is the permanent condition of silica under the oxygen blow-pipe. Alumina is much less volatile than silica; it often, however, undergoes ebullition. In a more recent essay, M. Gaudin has tried the temper and relations of rock crystal, which has afforded unexpected results. If a drop of melted crystal fall into water, far from cracking and flying to pieces, it remains limpid, and furnishes good lenses for the microscope. When struck by a hammer, the instrument rebounds, and the lump will sink into a brick rather than break: its tenacity is such, that pieces can be detached only as splinters. It resembles steel in elasticity and tenacity. Silicious compounds act nearly in the same way as rock crystal. The sandstone of the pavements spin off like it, with this difference, that its threads, instead of being limpid, are a pure white, nacreous, silky, and chatoyant, in a singular degree, so that they might be mistaken for silk; and the globules, to a certain degree, have the aspect of fine pearls. There is no doubt that in this way successful means will be employed in producing imitations which will be preferred to natural pearls, since they will possess the hardness of annealed rock crystal, instead of that of a calcareous compound. The emerald threads perfectly well, and its threads, which scratch rock crystal, are also more tenacious than crystal threads. — *Jour. de Pharm.*

Paint for Metallic Surfaces.—The scaling off of paint from metallic surfaces arises generally from the contraction of the paint leaving minute cracks through which moisture penetrates to the surface, and insinuates itself below the scale, this may be greatly palliated, by heating the paint before applying it, and by melting in it a small portion of bees wax, which prevents the shrinkage and the formation of cracks. A paint is much used in India for ornamenting work which is to be exposed to heat and moisture—viz.: finely granulated tin, or rather tin in fine powder (formed by shaking melted tin in a joint of bamboo, or a wooden box,) this is mixed up in a vehicle of glue water, is burnished by an agate when dry, and is then covered with oil varnish, in this state it defies for a long time the sun and rain of a tropical climate. K. H.

Symington's Condensation.—Sir,—In disputes between individuals and companies, I would in nine cases out of ten take the word of the individual, if I knew him to be an honourable man. Mr. Bowie having stated that I am in error on the cramming down throat point, I am willing to believe that I have been misinformed, and therefore trouble you with this to express a hope that he will not occupy your pages with "the facts of the case," which neither myself nor the public care anything about. I remain, your obedient Servant,

23rd November. SCALPEL.

Patent Composition for Fuel.—A correspondent of the "Monthly Magazine" in 1815, states that it was the practice in Wales to mix equal quantities of carbon or dross of coal and sea mud. This he states is laid up for use in large masses in sheds or cellars, and every morning a certain portion is well mixed with a spade and rolled by hand into balls of 3 or 4 inches diameter, six or eight of these are laid on the fire, &c. I need not point out to your readers the similarity to some of the patent compositions.

Nov. 9, 1840. C. C. C. C.

The Warrington Iron Steam-boat.—Sir,—On Wednesday the first iron steamer built in Warrington made a trip between that town and Liverpool, which she accomplished in two hours and nine minutes, the distance being over 30 miles, and having for three-fourths of the way a laden flat fastened behind. This vessel has been manufactured on the most approved plans by the Bridge Foundry Company of Warrington, which firm has long been famous for the make of flats and other iron boats to a rather large extent. The present vessel was launched from that Company's yard on the 21st January last, when she was named the *Warrington*, in honour of the town in which built. Her hull is wholly of iron, the extreme length of which is 110 feet, breadth 19 feet, and depth 9 feet 6 inches; she is divided into three parts by water-tight divisions of wrought iron; her burthen is from 2 to 300 tons; she has two engines of 70 horses power, with three boilers, beams, side levers, &c., as usual; the cylinders are 32 inches diameter, length of stroke 3 feet 6 inches, paddle-wheels 15 feet diameter; her draught is about 3 feet, and she will doubtless prove a useful vessel to parties who require speed and light draught of water. I am, Sir, your obedient Servant,

Liverpool, Nov. 16th, 1840. J. S. W.

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WHITELAW AND STIRRAT'S PATENT WATER-MILL.

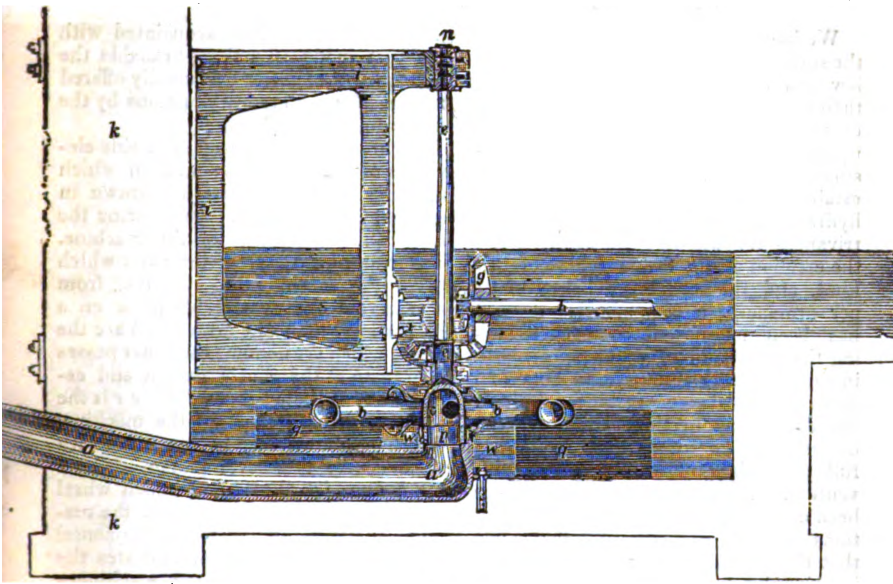
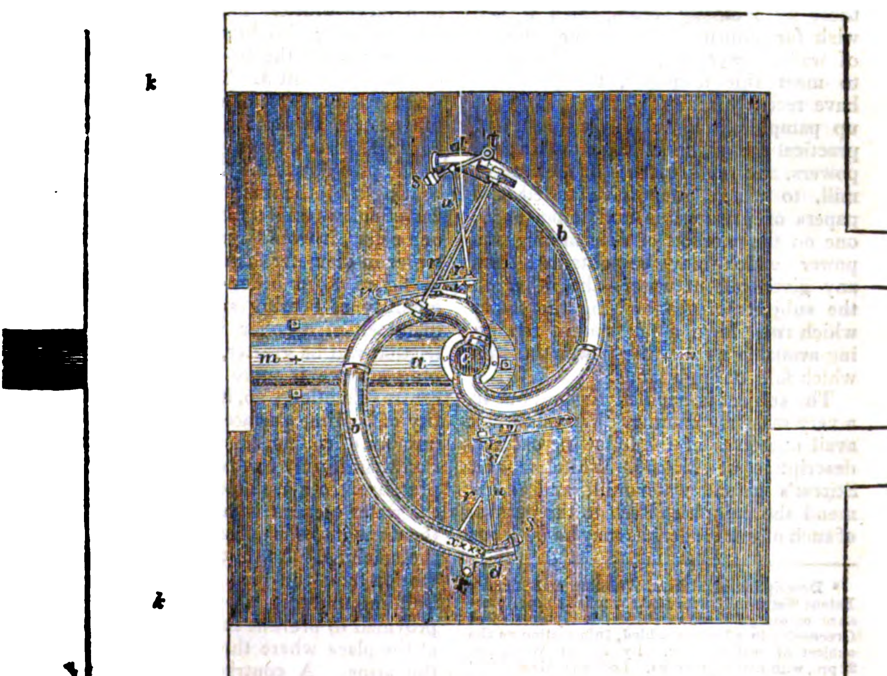


Fig. 2.



WHITELAW AND STIRRAT'S PATENT WATER-MILL.

We have on several occasions noticed the successful progress of Messrs. Whitelaw and Stirrat, in the application of their new patent water-mill. The results of the experiments already made, and upon a scale which precludes the possibility of error, have been such, as to establish the great superiority of this hydraulic machine over all previous contrivances for the like purpose. Since the erection of the first machine of this kind, and the reports published of its per ormances, a very general interest has been manifested by parties having the command of water-power, both in this and other countries, to obtain an accurate knowledge of its capabilities. Numberless applications have been *addressed* to us by parties, requesting full particulars of this important invention. The patentees themselves have been overwhelmed with similar solicitations from all quarters, and they state that they have found much difficulty in individually answering the applications made to them, more particularly as these were mostly accompanied with a wish for information on the subject of water-power in general. In order to meet this difficulty, the patentees have recently brought out a neatly got up pamphlet,* containing a clear and practical exposition of the construction, powers, and performances of their water mill, to which they have added two papers of great value and importance: one on the method of determining the power which may be obtained from any given fall of water—the other on the subjects of economising the water which runs down a fall, and of rendering available as a water-power the rain which falls on high lands.

The subject is handled throughout in a very masterly manner. We this week avail ourselves of the following extract, descriptive of Messrs. Whitelaw and Stirrat's patent water-mill, and commend the pamphlet itself to the perusal of such of our readers as may be desirous of making themselves acquainted with the best mode of making available the vast amount of power continually offered for acceptance in many situations by the bountiful hand of Nature.

Figure 1 (see front page) is a side elevation of the new water-mill, in which figure some of the parts are drawn in section. Figure 2 is a plan showing the arms and other parts of the machine. The main-pipe *a a* carries the water which drives the machine into its arms, from a reservoir or any suitable place on a higher level than the arms. *b b* are the arms, which are hollow; the water passes into them at the centre part *c*, and escapes out at the jet-pipes *d d*. *e e* is the main or driving shaft of the machine, which is shown cast in one piece with the arms. *f* is a bevel pinion, and *g* a bevel wheel; by means of which wheel and pinion the rotary motion of the machine is communicated to the horizontal shaft *h*, which again communicates the power of the machine to any machinery which it may be intended to work. *i i i* is a large bracket fixed to the wall or building *k k*; this bracket supports the shaft *e e*, while the bracket *l* carries one end of the shaft *h*. The perpendicular plane which passes through the parts represented in section in the elevation, figure 1, passes through the points *m m* in the plan figure 2. The top journal or bearing *n* of the main shaft has a number of collars on it; for, if there were but one collar, it would require to be made larger in diameter than the collars shown in figure 1, in order to get a sufficient quantity of bearing surface; but if the diameter of a collar be increased, the friction will be greater, as then the rubbing surface is more distant from the centre of motion; so, if a sufficient quantity of bearing surface is obtained by a number of collars, there will be less friction than if only one is used to resist the pressure. *q q* are holes through which the water escapes from the basin under the arms into the tailrace after it has left the machine. As the arms have a rotary motion, and the pipe *a a* is fixed to the building under it, there must be means provided to prevent the escape of water at the place where the main-pipe meets the arms. A contrivance suitable for this purpose is shown in figure

* Description of Messrs. Whitelaw and Stirrat's Patent Water-mill, with an Account of the performance of one of these machines, lately erected at Greenock; to which is added, Information on the subject of water-power. By James Whitelaw. 28 pp., with five engravings. London: Mechanics' Magazine Office, 166, Fleet-street. Glasgow: D. Robertson, 188, Trongate.

consists of a ring or projection round the underside of the aperture *c*, and of a part *p* turned cylindrical at the place where it fits into the pipe *a a*. A leather, similar to what is used in packing the large piston in a Bramah press, is inserted into the recess *w w*, turned inside of the top part of the pipe *a a*, in order to prevent the escape of water betwixt the pipe and the cylindrical part of *p*. It will now be clear that if the part *p*, and the ring on the underside of *c*, are accurately turned and ground upon each other at the place where they meet, the pressure of the water in the main pipe will act upon the under edge of *p*, and press it in contact with the projecting part round the aperture *c*, and in this way keep the joining of these parts water-tight. There is a flanch outside of *p*, with holes bored in it, to receive steadying pins fixed to the top part of the pipe *a a*; these pins are seen in figure 1; they prevent the part *p* from revolving, and are fitted so as to allow *p* to rise or fall. There is another use for the flanch round *p*, which is this: — A little rope-yarn is wrapped betwixt it and the main-pipe, to prevent the part *p* from sliding down whenever there is not a sufficient pressure of water in the main-pipe to support it. The pipe *a a* is bored out to receive the part *p*, which is fitted so as that it will slide easily up or down in the bored part. *r r r r* are the stay-bolts which support the arms. *s s* are valves, and *s t s t* are levers which work upon the centres *t t*, and form a connection of these centres with the valves. There is a lever on the top, and one on the bottom side of each valve. The rods *u u* form a connection with the levers *s t s t*, and the springs *v v v v*, fixed to the arms. The end next the valve of each jet-pipe (see figure 2) is a circle drawn from *t* as a centre; and each valve is curved to fit and work correctly upon the end of its pipe. The levers *s t s t* are adjusted so that the valves *s s* will work without rubbing upon the ends of the jet-pipes, in order to get quit of the friction as much as possible; but it is not essential that the valves should be correctly water-tight. It will be clear, that if the machine revolves so fast as to make the united centrifugal forces of the valves *s s*, the rods *u u*, the levers *s t s t*, and the springs, greater than the weight that will bend the springs *v v v v* to the distance shown in figure 2, the valves will recede from the centre of the machine till the force of the springs gets sufficient to overcome the centrifugal force of the valves, &c. Therefore, the centrifugal force will cause the valves to cover the ends of the jet-pipes, and so allow less water to escape, and thus diminish the force of the water on the machine whenever it goes quicker than the proper speed. If the springs are considerably bent or strained when the valves are full open, a very small increase of the speed of the machine will cause the valves completely to cover the ends of the jet-pipes, and when the ends of these pipes are closed, the water can have no power to turn the machine. From this it will be clear, that the machine can be made so that when it is doing very little work, it will not move at a much greater speed than it will when acting with its greatest power.

The new water-mill acts on a principle similar to that of the well known Barker's mill: but the arms are bent and otherwise shaped, so as to allow the water to run from the centre to the extremity of the arms when they are in motion, in a straight line, or nearly so, and in this way the disadvantages of carrying the water round with the arms, as is the case in Barker's mill, are got rid of.

The curve of the arms is such as to allow the water to run from their centres out of the jet-pipes, without being carried round by the machine, when it is in motion at its best speed. On this account, the rotary motion of the arms will not give to the water a centrifugal force. So the forces which work the new water-mill are simply the force of reaction, and the weight of a column of water of the same height as that acting on the mill, having the area of its cross section equal to the sum of the cross-sectional area of each jet-pipe. When the machine is standing, the one of these forces is as great as the other; but when it revolves so quick that the centres of the jet-pipes move at the same speed as that of the water flowing from them, the force of reaction ceases, as then the water falls from the jet-pipes without any motion, in a horizontal direction, for the machine leaves the water as fast as the acting column can follow it. When the resistance to be overcome is as great as will

balance the force caused by the weight of the water, there is still the force of reaction left to bring up the speed of the machine; and as the weight of the water remains the same, whether the machine is in motion or at rest, the force of reaction will carry up the speed till the centres of the jet-pipes revolve at a velocity the same as that of the water issuing from them before it ceases. Thus the machine, when its jet-pipes revolve at a speed as great as that of the water issuing from them, will give its maximum of effect, which maximum will be equal to the whole power of the water it uses; for, in the time a given weight of water is expended, in the same time the machine is able to raise as great a weight from the level of the centres of the jet-pipes to the level of the surface of the water in the lead. There is of course a small part of the power lost, most of which is that caused by the resistance which the water meets with in passing through the main-pipe and the machine. This portion of the force is very inconsiderable, as will be shown in the next paragraph; and, by making a slight alteration on some parts of the machine, this small fraction of loss may be still farther diminished.

A machine erected lately for Messrs. Neill, Fleming, and Reid, at their works, Shaws-water, Greenock, gives, when tested by the friction apparatus invented by M. Prony, 75 per cent. of the whole power of the water which works it. The power of the water is 79 horses, and the power of the machine is equal to that of 59.25 horses or 75 per cent. as now stated. Mr. Stirrat's water-mill of 2½ horses' power is the first that was made; it was tested in the same way as the above-mentioned machine, and the result of the experiment was equally favourable.

The following are some of the advantages which the hydraulic machine of Messrs. Whitelaw and Stirrat, has over an overshot water-wheel of the best construction. The new mill has a governing apparatus, which renders its motion as uniform as that of the best constructed steam-engine: when a part, or even the whole, of the machinery which it works, is thrown off at once, the variation in the speed is scarcely perceptible. The speed of the new machine is well suited for every purpose: generally speaking, it can be formed to make the required number of turns in a given time, and on this account, intermediate gearing is done away with. There is little wear and tear on the parts of the new mill, for its weight is perfectly balanced by that of the water, thus taking away almost all friction, and consequently wear, at the rubbing parts: five of these machines are already in operation, and not a workman has been employed in any way at either of them since they were first set a-going, although one has been in constant use for nearly two years. The new machine takes up remarkably little room. No very expensive building or other erection is needed for the fixing of the new water-mill, and the cost of the machine itself is very trifling in every case, and especially on a high fall, where an overshot wheel, as also the building and excavation required for it, become enormously expensive. On a fall of very great height where to erect an ordinary water-wheel would be altogether out of the question, the new water-wheel may be employed to great advantage. The new machine may easily be made to rise or fall according as the water in the tail-race is high or low, and one form of it will work to very considerable advantage in tail-water. The best constructed overshot water-wheel will not, after the speed is brought up for ordinary purposes, give more than 70 per cent of the whole power of the water which works it; and the new machine, as has already been shown, gives 75 per cent., and it can be formed to give even a greater portion of the power of the water than this.

SOLUTION OF THE DISC PROBLEM.

Sir,—Pursuing some investigations lately on a particular subject, the conclusions arrived at having differed widely from the explanations—at least such as I have seen given, of this phenomenon—induced the necessity of doubting their accuracy, and ultimately led to the following solution. Should it suit your convenience to transfer it to your influential journal I shall feel obliged.

I am, Sir,

A FRIEND.

Solution.

The attribution of an attractive power

to a blast of air seems rather an innocent idea.

The explanation of Doctor Hare, of Philadelphia, amounts to no more than that the force of the blast should be augmented, according to the increased area of the disc compared to that of the tube. Thus he states: supposing the orifice of the latter as 1, and that of the former 8, the force of the blast necessary to remove the disc should be 64 times that of the first impulse. I beg leave, however, to inform the Doctor, that if it were six hundred and forty times, instead of sixty-four, he would not be able to blow off the disc; he might move or advance it further, but to remove it were in vain.

The experiment of Mr. Reynolds in the exhausted receiver, although hitherto regarded as conclusive against the theory that ascribed the cause to the atmosphere, will appear, when minutely examined, to have no destructive influence on this theory.

Thus, when the disc was placed in vacuo, and the air admitted, the first impulse of the blast raised the disc, which, how *light* soever, was nevertheless *heavier* than *nothing;* so the instant it was removed, the vacuum became exposed, which offering no *resistance*, the air rushed in *laterally*. Again, the space over the disc being also void, and offering no resistance, the *lateral* current rushed up there, when *all* became as *in plenum*.

The phenomenon is due to the atmosphere. This ought to have appeared sufficiently evident, seeing that, whether the disc were at top or bottom of the tube, the same result followed, the pressure or resistance of the atmosphere being equal on every side.

Let a cylinder be placed round the disc, open at top, through the bottom of which the tube is admitted; let the cylinder be wider than the disc, leaving it room to play; now apply a weak blast, and the disc will not be blown out of the cylinder, but let a blast sufficiently powerful to overcome both the resistance to the area of the disc, and the waste of the escape by the sides of the cylinder, under these circumstances the disc will be blown *out* of the cylinder, although it may still be held *over* the cylinder. What is this but the atmosphere? Again, let a segment of the arc of the disc be *loaded*, say with a bit of lead, and the blast applied in the ordinary way of the experiment, in this case the disc will *turn* over as on a hinge, and be blown off the tube. Surely those who attribute an attractive power to the blast *per se*, will not assert that a piece of lead could destroy such a formidable foe.

Leaving the matter now to the consideration of your able correspondents, I shall conclude by advising what seems to me likely to be productive of some slight benefit in many cases, namely, that the safety valves for steam boilers be attached by a hinge or pivot, as pointed out in the experiment of the loaded disc.

OMICRON.

Dublin, October 28, 1840.

IMPROVED METHOD OF ADJUSTING SUN DIALS.

Sir,—It sometimes happens that much inconvenience attends the adjustment of a sun dial to its proper position with respect to the meridian, suitable instruments not being at hand to make use of for that purpose. I beg leave, through the medium of your valuable Magazine, to recommend the following method of adjustment of a horizontal dial. This method I have found to be very convenient, as the principal part of the operation I have performed by means of the dial itself, is as follows:—Let the dial be placed in a horizontal position, the plane of the gnomon nearly in the plane of the meridian, not fastening it down, in order that it may be turned on its centre if required; then make a small notch on the edge of the gnomon, sufficiently low that the shadow of the notch may fall on the face of the dial at the times of observation, which will be best about three or four hours before and after noon. If the dial should have two centres, separated by the thickness of the gnomon, a notch must be made on both edges of the gnomon at equal distances from their corresponding centres. At equal intervals of time before and after noon, compare the distances of the distances of the shadows of the notches from the centres of the hour angles on the corresponding sides of the dial. If the distances be

not equal, the dial cannot be in its proper position. To remedy this, move the northern part of the dial if in north latitude or the southern part in south latitude (by turning it on its centre) towards that side where the distance is the least, at the same time examine whether the horizontal position has been disturbed, if so it can easily be set right by means of a common level, this being the only instrument required in addition to the dial. A few observations will be sufficient to adjust the dial to its true position, when it can be fastened down. The best time of the year to erect the dial in north latitude will be in the month of June, when the sun will be at its greatest northern declination, and when the shadows of the notches will remain a longer time on the face of the dial, and consequently will admit of a greater interval of time (before and after noon) between each observation, thereby making the differences of the distances more perceptible, which will be very desirable, particularly when the dial is very near its true position. The adjustment may be made at any other time of the year, beginning the observation as soon as the shadow of the notch falls on the face of the dial.

I am, Sir,
Yours respectfully,
J. R. ARIS.

King Street, Stepney, 23rd Nov. 1840.

IMPORTANCE OF UNIFORMITY IN THE RATES OF RAILWAY CLOCKS.

Sir,—Of all the besetting sins of railway managers, *want of punctuality* is the greatest; to this cause may be traced nearly all the dissatisfaction so often expressed in the public prints, and to this cause alone is attributable the greater number of the serious and fatal accidents which have unfortunately been so rife, as to throw a sort of odium over this delightful and splendid mode of travelling.

The introduction of this system of locomotion, has made travelling more than ever a matter of calculation, and want of punctuality annoys the man of pleasure, and injures the man of business in no ordinary degree.

Railways are said to "annihilate both time and space;" this they can only do safely and satisfactorily by keeping time, and in order to accomplish this, more attention must be paid to the *time-keepers*.

While traversing one of the extensive lines a short time since, it came out on examination that only three of the clocks were together, and they were not right, nor did any one clock throughout the line indicate true mean time. The extreme variation amounted to *six minutes*, and when it is considered that at the ordinary speed of twenty miles an hour, this is equivalent to two miles of distance, the probable consequences of such a difference must be apparent. The rapid approach of a fast train, at a time when it was reckoned to be two miles off, might involve an awful sacrifice of life and great destruction of property.

It has been suggested that an illuminated clock at each station should exhibit the time of departure of the preceding train, but before time-pieces can be safely depended upon, more pains must be taken to obtain uniformity of rate, than has hitherto been done.

It would seem to be worth while to employ chronometers of the best construction for this purpose, but as the number required is great the expence might be an impediment; it is well known, however, that well-made clocks, with proper attention,* can be made to preserve a sufficient degree of uniformity, and I would earnestly call the attention of railway officers to this matter. Punctuality in the performances both of the men and machinery, are of vital importance to the prosperity, nay, even to the very existence of railway communication.

I am, Sir, yours respectfully,
WM. BADDELEY.

London, Nov. 27, 1840.

AQUATIC CLOTHING—PRESERVATION OF LIFE FROM DROWNING.

Sir, — Much has been said of the Aquatic Life Hat, a notice of which has appeared in your Magazine. It is said to be "adopted by the Deal boatmen;" one hat is also stated to be "capable of supporting four persons in the water,

* A competent person sent down the line once or twice a week, to detect and correct any variation would, I apprehend, ensure the required uniformity.

and if attached by a string to the coat, and the wearer should fall into the water and sink, his hat would float and show where he would be found."

It is well known that the human body is very little heavier than water, and that any person with his nose, eyes and mouth above water (all other parts being immersed) by keeping his chest inflated as much as possible, will float; it cannot, therefore, require many cubic inches of atmospheric air to render a body buoyant. These considerations induce me to be-believe, that instead of the "Aquatic Life Hat," greater security would be obtained if the fourth part of the air it contains were attached to the person in a different manner; it might be placed either inside the cravat, underneath the coat collar, or in the room of coat padding, or partly in each of these ways.

By this arrangement, a person falling into the water, instead of his hat on the surface, *would show us his head;* he would have full liberty to breathe, and would float until assistance arrived.

The Macintosh cloth is now made of very thin muslin, and so extremely light, that the desired quantity might be easily concealed in the dress as I have stated; it could also be applied to female use, by inflating the central parts of boas, or in the form of collars, small scarfs, &c., covered with some fashionable material to be worn either upon, or underneath a cloak or shawl.

I am, Sir,

Your most obedient servant,

H. WALKER.

20, Maiden-lane, Wood-street. Nov. 12,1840.

TEMPERATURE OF THE POLAR REGIONS—(NEW THEORY OF THE UNIVERSE, VOL. XXXII. P. 555.)

Sir,—Whether the Polar Regions are occupied by land or sea, appears to be a question that cannot, at present, be answered. There is another question which, although also unanswerable as yet, it may be interesting to ask—namely, what is the temperature of the climate at and near the Poles? We know that currents of heat continually flow from the equator towards the north and south. What must be the effect where the currents unite at each Pole? It is possible that there may not only be land, but land with a warmer climate than our own, and that the undecomposed elephants thrown on the Siberian coast may have been carried there by a flood from the Polar land. Such a circumstance would not be improbable, according to my "New Theory of the Universe."

Leaving this question for the present to the consideration of those who have more means of investigation on this subject than I can ever possess,

I remain, Sir,

Your obliged

E. A. M.

October 29th, 1840.

HAWKINS'S RHODIUM PEN.

Sir,—Will you, or any of your correspondents, inform me of the real merits of Hawkins's patent pen? I believe Sir John Robison stated at the recent meeting at Glasgow, that he had used one eight years, and still found it unimpaired. If this statement be correct, it is really a valuable acquisition to any one having much writing to do. I am desirous to have *practical information* on the subject, and shall be glad also to know its price, and where it can be procured. Trusting to your invariable disposition to afford information on every useful subject,

I remain, Sir,

Your most obedient servant,

PLUME.

Manchester, Nov. 23rd, 1840.

[Our correspondent has been misinformed as to the number of years the pen had been in use; Sir John Robison's statement was, that he had used it for *four* years, not *eight*. We believe, however, that pens of this description have been before the public near seven years, and we have heard it asserted by Mr. Hawkins, the inventor, that there is not an instance of one showing the commencement of wear, although many have been in constant use during the whole of that period. Mr. H. confidently states his belief that one pen will endure more than a hundred years of daily use. They are sold by Mr. Lund, of Cornhill, and Messrs. Roake and Varty, of the Strand, London.—ED. M. M.]

ON THE COURSE OR PATH OF THE ELECTRIC FLUID.—BY HENRY DIRCKS, ESQ.

Read before the Literary and Philosophical Society of Liverpool.

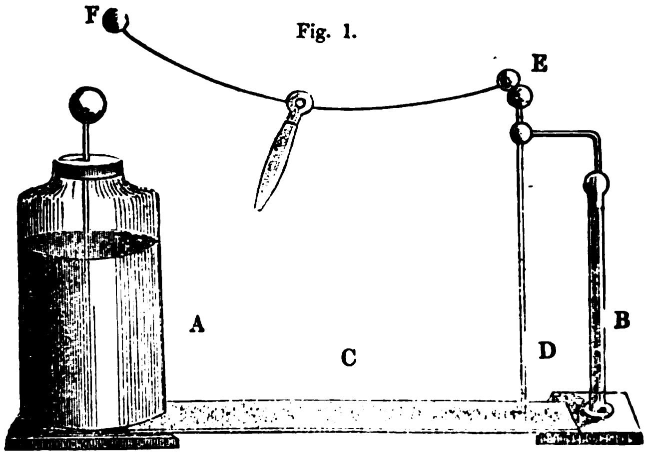
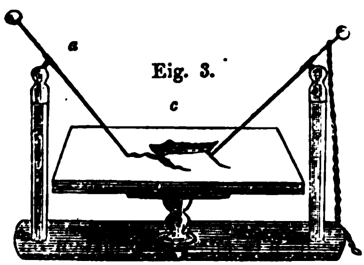


Fig. 1.

Fig. 2.



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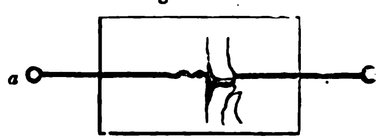


Fig. 4

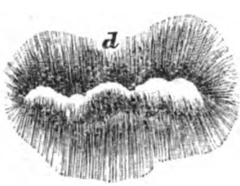


Fig. 5.

Although we have two principal theories by either of which we may account for electrical phenomena, yet as is well known there is no theory that is universally adopted. We prefer that of Du Fay of two fluids, the resinous and vitreous, whereas in America the Franklinian theory of a single fluid continues to be received. It is certainly a curious and remarkable fact that this important point, which appears to be at the very head of our enquiry in investigating the nature of this exceedingly subtle agent, should have so long withstood every effort that has been made to develope its operation, and that with our extended means of pursuing this interesting investigation, philosophers should still remain divided in opinion. We agree that it is the same agent which is at work in atmospheric, frictional, magnetic, voltaic, organic, and thermo-electricity. The same data are taken up by the favourers of either theory to prove their several positions; the influence of *points* is alike advanced to prove the existence of one and of two fluids. Franklin, and all electricians after him, speak of the star and the brush, the former negative, the latter positive; whereas Dr. Faraday contends, that under favourable circumstances, and especially in some gases, the negative and positive points both afford the electric brush of light. We

are all familiar with the experiments proposed as evidence of the existence of a single fluid, as the action of a flame between two balls, one positively the other negatively electrified, by which the latter becomes very much heated; the stream of air produced when a point proceeds from a conductor; the manner of charging the Leyden phial; and especially that given by Mr. Lullin, when the discharge of a jar is made to perforate a varnished card, between two points on either side, but half an inch asunder, by which the point proceeding from the negative side invariably perforates the card, although a hole may have previously been made opposite the positive point, where a perforation does not otherwise occur; also the common discharge through a card placed against a charged jar, where a burr is produced on both sides, but more markedly if the card is set vertically between the points of the universal discharger, when the burr will be found larger on the negative side, where the positive electricity may be supposed to make its exit, and smaller on the positive side, the outlet for the negative or resinous electricity. The appearances by perforating bodies might at first seem conclusive that there are two fluids, but it has occurred to the writer, and may be worthy of notice here in explanation of the double burr, though he has never met with any notice of a similar view of this subject being taken by others, that, as the electric fluid is so readily excited by friction pressure and slighter causes, the electric discharge itself, by its amazing rapidity, may become the exciter of a quantity of the fluid previously latent, which being wrought into activity, a reaction may be thereby produced, and this whether there is one or two fluids. This seems to be both a reasonable and highly probable consequence.

We here have instances of the effects of the electric fluid, but can neither arrive at any conclusion respecting its nature, nor ascertain the direction of its course. As we might hope to arrive at something more conclusive by considering this latter point, which indeed is the main object of the present paper, we shall proceed to this more important enquiry.

One known means of tracing the passage of the electric discharge, is that made, when the points of the univeral discharger, are placed an inch apart on a card having a broad line painted on it with vermillion, when the discharge leaves a well defined irregular black line. Observation in this way, however, is very limited. We wish to arrive, for instance, at something definite, whethe there is one or two fluids; and we wish to see in the path it takes whether it passes right over, meets halfway, or passes side by side. In short, what are the peculiarities exhibited by the discharge of the Leyden jar?

Dr. Faraday, in his most excellent and elaborate "Researches," states that an ever present question on his mind has been—"Whether electricity has an actual and independent existence as a fluid or fluids, or was a mere power of matter, like that we conceive of the attraction of gravitation?" "If determined *either way*," he adds, "it would be an enormous advance in our knowledge." Not only every experiment which has for its object the elucidation of electrical phenomena, but likewise the opinions of electricians, may truly be said to be of extreme value. It is well, therefore, that Dr. Faraday has put on record as well in what he succeeded as in what he failed. The ill success of one may suggest another course of experimental enquiry to some other worker in this prolific field of scientific research, and thus we may hope gradually to develope many important results in connection with electrical science, from which, with good cause, we expect to reap many discoveries of great practical benefit.

It early appeared to me quite within the range of possibility to render this active fluid a tell-tale, as it were, of its own progress, especially in conducting the discharge of the Leyden battery. I felt convinced of this from what has already been noticed of the piercing of cards, the black line left on a vermillion coloured card, and also from the markings left on the uncoated glass by the spontaneous discharge of an overcharged jar. But my object was to obtain evidence on a larger scale, and of a more conspicuous character.

My first experiments were made with a piece of window glass 4 inches square smeared on one side with a mixture of flower of sulphur and white lead ground together with gum water, laid evenly on the glass and dried. When placed against the side of the Leyden jar, the

charge may be passed over it by using the discharging rod, in which way a dark brownish line, 2 or 3 inches long having a circuitous course is easily produced.

Not satisfied with this result, I at length adopted a plan which successfully affords an interesting illustration of the path of the electric fluid through a considerable space, varying with the quantity of charged coated surface. From 18 inches to 2 feet is easily obtained with a gallon jar, or battery of equal capacity, provided the electrical machine is in good working order. The means of effecting this will appear very simple, though the conditions requisite for its success are not so obvious as might at first appear. Take a broad oblong plate of glass, place under it a sheet of white paper, then by striking a fine hair-sieve containing iron filings let fall on the glass an equal distribution of the filings until they communicate a dark-grey shade over the paper. The glass so prepared is to be placed in the line of communication for marking the discharge. When this is done with the white paper under the glass, the result is most conspicuous, beautiful and interesting. The appearance that instantly follows is something like a map of a serpentine river, with often small branches issuing out in many streams at some of its principal windings, and again running into the main branch. Throughout the tortuous course of this passage the iron filings are swept away to the breadth of $\frac{1}{8}$th to $\frac{1}{4}$th of an inch and upwards by the rapid transit of the fluid, with as much neatness and precision as if carefully removed by some process requiring extreme care and delicacy of manipulation (see fig. 2). Often a few grains form an irregular central line. If a short piece of crooked wire in the form of a ring, arch, or helix, be placed in, or a little out of the direction of the fluid, it is made part of the circuit and the filings are not disturbed if any arched form or immediate connection offers a more perfect conductor. On shaking the filings off the glass no trace appears to remain, until breathed upon when a clear thread like having a slight dark colour becomes distinctly observable.

The success of this experiment seems to depend on a peculiar arrangement, and the best I have found is to have the Leyden jar placed on the edge and touching the filings at one end of the glass plate; a perpendicular rod of thick wire being at the other, from the top of which, a connexion may be made (by a discharging rod,) with the ball of the Leyden phial (see fig. 1). A full charge is requisite to make a good working of the path and the filings should not be two thickly spread, otherwise the electricity passes over in flashes; a communication too should be made between the outside of the jar, and some good conductor. The vertical pillar at the further end of the plate has been found to answer when long thin bent wires proved quite ineffectual.

It is only to be regretted that this beautiful experiment leaves the subject still open to enquiry, but this may be one step, which in other hands may be made serviceable in obtaining greater results. I cannot pass over in this place mentioning a very easy means of tracing, and so registering the several experiments made at each discharge. This is done by taking the glass, strewed with filings, and having a marking which is to be copied; on each end, or down each side, place a thin lath, on this lay another, but plain glass of equal size, over all place a slip of paper long enough for a tracing. Now rest the glasses between two tables set apart, or between two flat bars of wood resting on a table, and in such a situation, that a small lighted candle placed on the floor will throw the shadow of the filings up through the glass on the back of the paper. There being no other light in the room this is easily done. Or by giving a coating of thick glue to cartridge paper, this, if carefully managed, would take up the filings of the glass, and show a reversed specimen of the electric path. In this way I have taken up the filings and preserved the figure made by the magnet.

Another experiment, too interesting to be omitted, was performed with a few sheets of strong printing paper stitched like a pamphlet. In the first experiment made with this, it was laid on the table of the universal discharger, and the balls being removed, the blunt pointed wires were placed on the paper an inch and a quarter asunder; the discharge of a very large jar, slit the paper, giving it the form of two small folding doors (figs. 3 and 4). With a mixture of equal parts of flower of sulphur and red lead, the face

of the upper and three lower leaves were strewed over. The result on making the discharge was not always the same—thus:

Experiment 1. In a passage of 1¼ inch the positive end was harmlessly passed over for more than ⅓rd, leaving a dark line on the top leaf; from hence to the negative end the paper was ripped open, the cut being in shape like the letter H. On examining the lower or second leaf, the remaining two-thirds of the passage, that is, the horizontal line of the H presented a broad black marking, which had stuck also to the under side of the upper leaf. The third leaf was untouched.

Example 2. This was precisely the same as the foregoing, with the exception of being a shorter path and more violently torn, so that the rent formed a very oblong H, and the positive side was uninjured for near half-way. The remaining half, which we call the negative side, showed a broad black band on the face of the second leaf.

Example 3. This passage was remarkable from the paper being pierced on the positive side, clear of the rent beyond it, which was of a very imperfect H form. The paper was unmarked and uninjured for one quarter of the path on the positive side at the end of which the paper was pierced with a small hole. On the second leaf a round black spot occurred corresponding with this terminus of the positive side, and at the negative end where the rent begins there was another black spot or star, both connected by a straight cut in the paper, not discoloured, and branching off right and left at the negative end, in form like a T. The third leaf not marked.

Example 4. Here the passage from the positive was marked ⅓ with a faint line, at the end of which a small hole appears, and another hole at the commencement of the negative passage, without tearing the paper. On the second leaf these holes have corresponding black perforated spots, and on the third leaf there is a broad black mark, fig. 5 *d*, with a corresponding one, fig. 5 *e*, on the upper side of the leaf above it. These black marks are all very like the representations of mountains in a map, and have a white band running through their centre.

Here, as in Mr. Lullin's experiment, there is a tendency on the negative side to enter the paper although its surface is covered with a conducting substance. There is more violence too on this side, where, indeed, we have a disruptive discharge. These experiments are, on many accounts, exceedingly interesting. It would appear as if the positive or vitreous electricity had greater velocity than the negative; that the two electricities meet at this point, and uniting cause an explosion followed in this instance by a chemical effect—the production of a sulphuret of lead, which marks *only* the remaining two-thirds of the path. This, if correct, would seem to offer some modification of the remarks Dr. Faraday makes on the current. He says, "It is a most important part of the character of the current, and essentially connected with its very nature, that it is always the same. The two forces are *everywhere* in it. There is *never* one current of force or one fluid only. Any one part of the current may, as respects the presence of the two forces there, be considered as precisely the same with any part; and the numerous experiments which imply their possible separation, as well as the theoretical expressions which, being used daily, assume it, are, I think, in contradiction with facts." What he next adds is too remarkable in connection with our experiments not to call for special notice. "It appears to me to be as impossible to assume a current of positive or a current of negative force alone, *or of the two at once with any predominance of the one over the other*, as it is to give an absolute change to matter." [1627.] The establishment of this as a fact, or its disproof, he justly considers of the utmost importance.

We might almost be inclined to inquire in reference to the electrical experiment, from the consideration of which we have digressed—Has the resinous electricity a tendency downwards and the vitreous a tendency upwards? Or has the latter greater velocity than the former? Or do these experiments at all prove "that the centres of the two forces (or electricities), or elements of force, can be separated to any sensible distance?"

November, 1840.

Description of Engravings.

Fig. 1, the arrangement of the apparatus. A the Leyden jar; B an upright

glass pillar mounted with a ball and wire, supporting the vertical thick metal rod D E; E F, the discharging rod to complete the connection; A C D, the glass plate strewed over with iron filings.

Fig. 2, the same glass plate as above, but with the marking left by the discharge.

Fig. 3, a few sheets of strong printing paper, stitched at the back, and placed between the wires of the universal discharger, *a* being the positive, and *b* the negative side. The paper is not torn except close to *b*, and a short distance from *a*.

Fig. 4, shows the positive electricity entering at a small hole, which it has pierced a little in advance of the torn paper which lies on the negative side.

Fig. 5, the result of the 4th experiment with the arrangement fig. 3, in which a sulphuret of lead was formed on the third leaf of the paper.

MR. SANKEY'S DEMONSTRATION OF THE THEORY OF PARALLELS DEDUCED FROM THE ASSUMPTION OF ONE RECTANGLE.

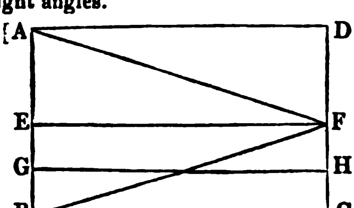
Sir,—In the *Mechanics' Magazine* for the 26th of April, 1840, I stated, that "if the theoretical formation of *any* one *rectangle* can be demonstratively proved, the doctrine of parellels will be completely established by taking multiplies of the rectangle *ad infinitum, &c.*"

As *some* of your readers perhaps may not be able to make out the proof of this for themselves, I am induced to offer the following demonstration:—

Lemma 1.

In any Rectangular Quadrilateral the opposites sides will be equal.

Let A B C D be the given quadrilateral whose angles at A, B, C, and D are right angles.



Bisect the side A B in E; at E erect E F perpendicular to A B, cutting D C in F, since by 17 Prop. Book 1st, it cannot meet either of the sides A D or B C. Join A F and B F; then, in the two triangles, A E F and B E F, we have two sides in the one equal to two in the other, namely, A E = B E and E F common; also the contained angles at E equal as being right angles; therefore, the remaining angles are equal, as also the side A F = B F. Therefore, in the triangles A D F and B C F, we have now one side and two angles equal; viz. A F = B F; the right angles at D and C equal; also, subducting the equal angles E A F and E B F from the right angles at A and B, the remaining angles D A F and C B F are equal; therefore, by the 26th Prop. Book 1st, the remaining sides and angle are equal; consequently, the side A D = B C, the opposite sides of the given quadrilateral. In like manner it can be shown that the side A B = its opposite, D C. *Q.E.D.*

Cor. 1. Since the angle E F A = the angle E F B and the angle A F D = the angle B F C; therefore, their sums E F D and E F C are equal, and consequently, right angles. Also, F D is equal to F C, therefore, the perpendicular E F, bisecting the side A B, bisects also its opposite C D perpendicularly.

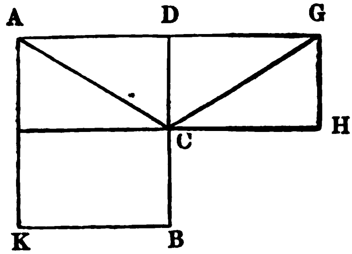
Cor. 2. As E F C B is also a rectangular quadrilateral, it can be shown in like manner, that the bisecting line E F = either side A D or B C. Bisecting E B again in G, and raising the perpendicular G H, this bisecting line G H will also be equal to the side B C, so that by constant bisections pursued *ad infinitum*, it can be shown in general, that a perpendicular raised at *any* point to any of the sides A B or A D, and meeting the opposite sides C D or B C will cut them perpendicularly, and be equal to B C or C D, the sides opposite to these perpendiculars. These perpendiculars will also intersect one another at right angles, and form new *rectangular* quadrilaterals with the sides of the given quadrilateral and with one another.

Lemma 2.

Supposing any Rectangular Quadrilateral to be formed, a Rectangular Quadrilateral can be obtained whose sides shall be greater than any given.

Let A D C B be the given rectangular quadrilateral, produce A D to G, so that G D = A D, and B C to H, so H C =

B C, join G H; then, I say, A B H G is

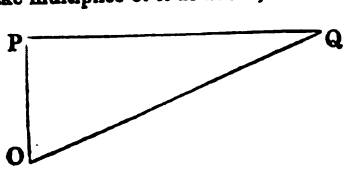


also a rectangular quadrilateral. For join A C, G C; then in the two triangles A D C, G D C, we have two sides in the one equal to two sides in the other A D = G D and C D common, also the right angles at D equal: therefore, the side A C = G C, and the remaining angles are equal, consequently, in the triangles A C B and G C H, we have also two sides in one equal to two in the other, viz., A C = G C and B C = H C and the angles between A C B (= D C B —A C D) = G C H (=D C H—D C G), therefore, the remaining angles are equal; and the angle at H = the angle at B = a right angle; also the sum of the angles at G = the sum of the angles at A = a right angle. Consequently, the figure A B H G is also a *rectangular* quadrilateral whose opposite sides are therefore equal, which can be doubled again and again, till the side A G′ exceeds any given line. In like manner also the other sides A B and D C can be produced to K and I, and a *rectangular* quadrilateral A D I K be formed, and so on *ad infinitum* till the side A K′ exceeds any given.

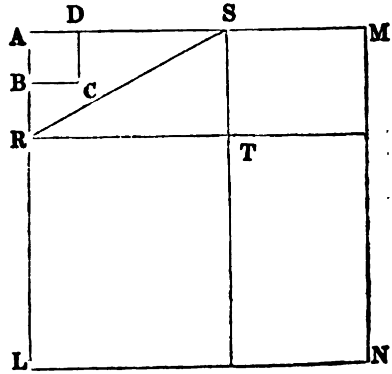
Proposition.

The angles of any *right angled triangle are equal to two right angles.*

Let O P Q be the given right angled triangle; let A B C D be the rectangle, which is assumed to have been formed; take multiplies of it as above, till we ob-



tain a rectangle A L N M, whose sides A L, A M shall be greater than O P, P Q the sides of the given right angled triangle; then in A L and A M take A R=



O P and A S = P Q, join R S and the triangle A R S=the given triangle O P Q, two sides of the one being equal to two in the other and the contained angles right angles. At R and S erect perpendiculars to the sides A L, A M and intersecting one another at T, where, by Cor. of Lemma they will cut one another at right angles; consequently, the quadrilateral A R T S will be a rectangle, and its opposite sides equal; therefore the right-angled triangles R A S and S T R are equal, and the angle A S R= angle S R T; therefore, the sum of the angles A S R and A R S=the angle A RT = a right angle. Therefore, the three angles R A S + A S R + S R A = two right angles; consequently, the sum of the angles of the given triangle O P Q also = two right angles. *Q. E. D.*

Cor. In *any* triangle the sum of the angles are equal to two right angles. Let fall perpendiculars on the side which lies between the two acute angles, then the triangle will be resolved into two right angled triangles, and the sum of the angles of each will be equal to two right angles. Consequently, the sum of the angles of both together will equal four right angles, from which deducting the two right angles at the perpendicular it will leave the sum of the angles of the given triangle equal to two right angles. *Q. E. D.*

N. B. From the 17th Prop., it follows that there must be always two acute angles in every triangle.

I am, Sir, yours, &c.

WILLIAM S. VILLIERS SANKEY, M.A.

COMPARATIVE FITNESS OF BLACK AND WHITE PAINT.

Sir,—As you were so kind, in noticing my communication, to insert the article on black paint by Mr. Kenning, I beg leave to hand you that part of the article, Painting (*Penny Cyclopædia*), which treats on the same subject; as, although the authors differ, they may both be right; and although black paint may be injurious in hot climates, it may be more durable than white in temperate ones. If you can find room for these remarks, and the enclosed quotation, in your most useful Magazine, you will much oblige yours,

Respectfully,
W. H. James.

P.S.—If black is worse for wooden, it may be best for iron vessels, even in hot climates, so that the subject deserves investigation.

Queen-street, Camden-town, Nov. 23, 1840.

"It is a generally received opinion among painters, that white lead is the best material for painting work of all descriptions, with a view to its preservation, and they affirm that black is useless in that respect. Now, presuming that the durability of paint depends on the insolubility of the materials used in its composition, we might infer that black, which is composed of one of the most imperishable bodies known, namely, carbon, in the state of lampblack, is more durable than white, which is made of carbonate of lead, a substance slightly soluble in water; and the following facts confirm this. To be able to judge fairly, we must have black and white of the same age equally exposed, and on the same material. These conditions are all fulfilled on finger-posts and other public notices exposed by the highways and on wooden grave-rails in country churchyards, which are almost invariably painted and written either black and white or white and black. Those with black grounds and white letters may often be seen with merely the illegible remains of the inscriptions, while the ground is quite perfect. But the black writing frequently remains not merely till the white ground is washed away, but often till the surface of the wood, except where it is occupied by the letters, is decomposed to the depth of more than a sixteenth of an inch, actually leaving the inscription in relief; and although most general rules are said to have exceptions, the writer has never met with one to this."

ON THE ACTION OF STEAM AS A MOVING POWER IN THE CORNISH SINGLE PUMPING ENGINE.—BY JOSIAH PARKES, M. INST. C. E.

In this communication the author presents a detailed analysis of some of the facts collected and recorded by him in his former communications, with the special object of ascertaining from the known consumption of water as steam, the whole quantity of action developed—the quantity of action had it been used unexpansively—the valve of expansion—the correspondence between the power, and the resistance overcome—and, finally, a theory of the steam's action, with a view of determining the real causes of the economy of the Cornish single pumping engine.

The data employed for the purposes of this investigation are those obtained from the Huel Towan engine by Mr. Henwood, from the Holmbush by Mr. Wicksteed, and from the Fowey Consols, and recorded in the author's communications in the Transactions of the Institution of Civil Engineers, Vols. ii. and iii.

Steam may be applied in one or other of the two following modes:—Expansively, that is, when admitted into the cylinder at a pressure greater than the resistance, and quitting it at a pressure less than the resistance; or unexpansively, that is, when its pressure on the piston is equal to the resistance throughout the stroke. By the term *economy* in the use of steam, is meant the increase in quantity of action obtained by the adoption of that mode which produces the greatest effect.

The weight of pump-rods, &c., which effects the pumping or return stroke in a Cornish engine, is greater than the weight of the column of water, by the amounts necessary to overcome the friction of the water in the pipes—to displace the water at the velocity of the stroke—to overcome the friction of the pitwork, and of the engine itself. The absolute resistance opposed to the steam, consists of the weight which performs the return stroke, plus the friction of the engine and pitwork, and the elasticity of the uncondensed steam.

The water-load in the Huel Towan engine was very accurately ascertained as 11 lbs. per square inch on the piston; and it is shown that the additional resistance amounted to 7 lbs. in the Huel Towan, and to 6 lbs. in the other engines, so that the whole resistance in the Huel Towan engine is 18 lbs. per square inch of the piston. Now, the elastic force of the steam at the termination of the stroke, and before the equilibrium valve is opened (ascertained from the ratio of the volumes of steam and water consumed), is only 7 lbs. per square inch, that

is; 4lbs. less than the water-load alone. The corresponding results for the other two engines are equally remarkable, and show most distinctly that, at the termination of the stroke, the pressure of the steam is far below the water-load, as had been previously observed by Mr. Henwood and others.

The next step in the analysis is to determine the portion of the stroke performed when the pressure of the steam in the cylinder is just below the resistance, and then to separate and estimate the spaces through which the piston is driven respectively by steam of a pressure not less than the resistance, and less than the resistance. These facts being ascertained, the virtual or useful expansion, and the dynamic efficiency of the steam, during the two portions of the stroke, are known; and it appears that there is a deficiency of power, as compared with the resistance overcome, of above 3lbs. in the Huel Towan, and more than 4lbs. in the other engines, per square inch on the piston.

From these startling facts, and a careful examination of Mr. Henwood's indicator diagrams, the author was induced to inquire whether the piston had not been impelled by a force altogether distinct from the continuous action of the steam upon it, namely, by a force which is to be referred to the sudden impact on the piston when the admission valve is so fully and instantaneously opened, as it is in these engines, and a free communication established between the cylinder and the boiler. To this instantaneous action on the piston, the author, for the sake of distinction, assigns the term *percussion;* and, proceeding to analyse the authentic facts under this view, it appears that the space of the cylinder through which the piston was carried by virtue of this percussive action was about 21 inches in the Huel Towan, 27 inches in the Holmbush, and 33 inches in the Fowey Consols engines.

The results thus unfolded, which are facts independent of any hypothesis, appear less startling on a full consideration of the circumstances under which the steam is admitted into the cylinder. The engine has completed a stroke, and is brought to rest by the cushion of steam between the piston and the cylinder cover; a vacuum is formed on the other side of the piston; the elastic force of the steam in the cushion then nearly balances the resistance. A communication is now suddenly opened between the cylinder and the boiler containing steam of a high elasticity; and the piston, being ready to move with a slightly increased pressure, receives a violent impulse from the steam's instantaneous action. The piston having started, the influx of the steam is more or less retarded by the throttle valve, and its elastic force, though at first greater than the resistance, is soon reduced considerably below it, the mass of matter in motion acting the part of a fly-wheel, absorbing the excess of the initial power over the resistance, and discharging it by degrees until the stroke is completed.

The indicator diagrams, which are the transcripts of the piston's movements, show that such may be the nature of the action on the piston, and the discussion of numerous well-established facts and phenomena, for the Cornish engines, strongly confirms this view of the case. Whatever may be the theory of the steam's action, the fact that the sum of those actions has carried the piston through its course, is certain; and it seems equally certain that the quantity of water as steam which entered the cylinders was insufficient alone to overcome the resistance.

The author then investigates the amount of useful action due to the steam imprisoned between the piston and the cylinder cover, and recovered each stroke, which, for its use in bringing the engine to a state of rest at the end of the return stroke, he terms the *cushion.* This quantity, though small, is appreciable, and its value is assigned for each engine.

The author treats, lastly, of the evidence furnished by the diagrams of the indicator, and of its utility as a pressure gauge. The communication is accompanied by elaborate tables of the results of the analysis, and an appendix with the calculations worked out in detail.—*Trans. Inst. Civ. Eng.*

ELECTRICITY OF STEAM.

A curious, and probably a most important, discovery in this branch of natural philosophy, was made about a fortnight ago, in a boiler attached to a hauling engine, at Seghill, on the Cramlington Railway, near Newcastle. The engineman on attempting to lay hold of the lever of the safety valve, received what he describes as a severe blow, which nearly caused him to fall; he, a second time attempted it, and received a similar blow. This having been made known, an examination of the boiler followed, and it was found that the steam which was escaping from a "*blower*" near to the safety valve, was highly charged with electricity. Our informant states that on himself placing one hand in the steam, sparks upwards of half an inch in length were emitted from the other, and this whilst he stood upon the masonry which was surrounding the boiler: so that had he been upon a glass stool the effects would have been much greater. We are glad to hear that this discovery is being followed up by experiments on other boilers; when the discovery was made, it was considered by many to be owing to the quality of

the water used, which was pumped from the coal mine; subsequently, however, on trying the steam from a locomotive engine on the Newcastle and North Shields Railway, a great quantity of electricity was obtained, and the water used in this case was from the River Tyne. The subject is highly interesting, and we hope that the discovery may lead to useful results; the explosion of boilers has hitherto baffled research, and it is not improbable that elasticity is intimately connected with it.—*Gateshead Observer.*

We were the first to announce the recent discovery of the existence of electricity, to an enormous extent, in the steam discharged from steam-engine boilers, and we are now the first to lay before the public a satisfactory explanation of that singular phenomenon.

Since we first noticed the subject, experiments have been actively prosecuted by Mr. W. G. Armstrong, of Newcastle, in conjunction with Mr. Robert Nicholson, the engineer, upon the locomotive engines of the Newcastle and North Shields Railway; and which have led to the conclusion that the electricity is developed by the *condensation* which takes place when the steam escapes into the air.

Our informant, who was present, and took part at most of these experiments, furnishes us with the following particulars and observations:—

When the steam was discharged through a tube composed of hollow glass rods, connected together with brass stop-cocks, none of the cocks, except the last one, or that from which the steam issued into the air, indicated either negative or positive electricity. The steam, therefore, could not possess *free* electricity *in the boiler;* for if it did, it would have imparted its positive electricity to all the cocks through which it passed on its way to the discharging orifice. Neither could the electricity be acquired *by friction* in the tube; because, in that case, the steam would have absorbed the natural electricity of the cocks, and rendered them *negatively* electrical.

The air in the vicinity of the jet of steam yielded *positive* electricity; whereas, if the steam had acquired its electricity by *expansion*, or other mechanical process, operating on its escape from the orifice, the adjacent atmosphere would have been deprived of its electricity, and made *negative*. Everything, therefore, but *condensation* was disproved; and that condensation should really be the cause of the phenomenon, is perfectly consonant with reason; since it has long been known, that electricity is taken up in evaporation, and given back in condensation, although the *extent* of the electrical disturbance has hitherto been supposed to be very small.

A pointed wire, passed into the steam, through a glass tube inserted in the boiler, drew off no electricity; which furnished an additional proof, that *active* electricity did not exist in the steam within the boiler. Upon insulating the boiler, it became *negatively* electrical, proving an absorption of electricity by the steam, and thereby corroborating the explanation just given of the phenomenon.

By collecting the electricity from a copious jet of steam, by means of a great number of pointed wires, effects were produced equal to those of an unusually powerful electrifying machine. Sparks of no less than 4 inches long were obtained in rapid succession; and in the experiments in which the glass tubes were employed, the most beautiful and singular coruscations of electrical light were exhibited.—*The Gateshead Observer.*

SURFACE CONDENSATION—AND ON THE PROPER USE OF STEAM EXPANSIVELY.

Sir,—In pursuing the subject of surface condensation, I will not pretend to enquire as to whom the chief merit of the system is to be ascribed. Certain it is, however, that several individuals have adopted the principle for years, and steam ships have long been working with condensers composed of copper tubes, other than Mr. Hall's, of which I am myself cognizant. By these observations I do not mean to detract from the merit due to Mr. Hall; on the contrary, I am only speaking to facts; for to that gentleman, of whom I know nothing beyond what I gather from the public prints, must be conceded, at all events, the praise of most indefatigable and praiseworthy endeavours to bring this valuable system into general use, as well as great skill in its management. If there should be errors, which I confess I do not see—and where, allow me to ask, is the most profound thinker that does not commit them occasionally—it affords no reason why a man's honesty of purpose should be impugned on that account.

The common condenser is composed of a chamber, into which the steam passes from the cylinder, and coming into immediate contact with the "injection," a body of cold water flowing in in a continuous jet, a very large portion is instantly deprived of its power, and the water resulting from the operation; also the remaining vapour, to an extent, is withdrawn therefrom by the air pump.

The surface condenser is composed of a large number of small copper tubes, about 8 feet long individually, placed at a small

distance apart in a vertical position, having their open ends inserted, air tight, into a chamber perforated to receive them both at the top and at the bottom. The condensing water is passed through, this body of tubes enveloping their whole exterior surface, while the steam from the cylinder is received into the top chamber, and spread so as to enter the whole simultaniously, the bottom chamber receiving the water resulting from its condensation, whence it is extracted by an air pump in the usual manner.

The elasticity of the remaining vapour, by either mode, will vary with the difference of "temperature" of the water, and likewise with "that" of the steam, as well as with the "quantity" of the one compared with the other. Therefore, if a better vacuum is obtained by surface than is usual by injection, and which there exists no reason for doubting, both from a greater body of cold being exposed, and from the absence of the air carried into the "common condenser" by the injection, it is, I presume to think, pretty strong evidence that the system must be efficient.

But it may be said, that notwithstanding a better vacuum is shown, the "time" taken to effect it more than counterbalances the benefit derived. Now though the chief evidence opposed to this at present, for aught I know, may be what the gauge furnishes, yet I think even that instrument affords sufficient to satisfy any candid, unbiased mind. Supposing, for instance, the vacuum in the condenser were a perfect Torricellian, and the mercury of the gauge attached to the bottom chamber to remain "stationary," notwithstanding the discharge of steam from the cylinder at every stroke, this would be proof positive that the condensation was effected with a rapidity equal to the velocity of the steam rushing into a vacuum, as it never reached the gauge; and no mode of condensation, be it what it may, can clear a cylinder more speedily. But as vapour, of greater or less density, according to the degree of vacuum obtained, is at all times present, it follows that, however attenuated such vapour may be, its compression by the rush of steam from the cylinder must be perceptible by its action on the mercury in the gauge, the extent varying with the density, and which indeed is always the case; but it does not follow that the condensation is performed less instantaneously or perfectly on that account, than in the hypothetical case above. To judge of this, we must attentively observe the gauge (if there be no indicator), and if the recession of the mercury differs nothing materially from the rapidity of the rise, we may conclude that it is performed like the above, in the shortest possible space of time. On the contrary, if the mercury rises (I am assuming it to be Bedwell's gauge) to a greater extent than is due to the density of the permanent vapour, and its return is comparatively sluggish and slow, it is evident that too much "time" is occupied in the operation, and the effective power on the piston is, of course, neutralized in proportion.

Hence we are justified in concluding, at the mercury in the gauges of the *British Queen* remained "steady" (not "stationary") having but little motion, without even a reference "to the difference of vacua," that the permanent vapour in the condenser was of extreme tenuity, and that the steam was condensed as instantaneously as it is possible for any means to accomplish it.

Judging then from the foregoing facts and reasoning, the correctness of which is fully confirmed by the practical efficiency of the principle on board other vessels, it does not appear that any solid objections can be taken to the system, however it may be assailed by specious reasoning, founded on unwarrantable assumption and the distortion of facts: a course of procedure at all times to be lamented, and particularly reprehensible in scientific questions, where truth should ever be the guiding star, and personal interest or party considerations never be allowed to intrude.

If power be required to work the condensing water-pumps from which injection condensers are free, the air-pumps in this case are relieved from lifting the injection water, which, together with the reduction of the friction of the slides, the pistons, the air-pump buckets, and their respective rods, through the purity of the water employed, will probably more than compensate the cost; while the little attention required in a heavy sea, compared to condensation by injection, gives great advantage in that particular; and with regard to a litlte increase in the original outlay, that sinks into insignificance in comparison to the value of the protection from decay afforded to the engines and boilers.

Apart from all this, however, a grand object will be accomplished by means of this system, or indeed by any system which ensures a supply of "pure distilled water only" to the boilers; compared to which anything here set down on the increase of power said to emanate from the superior vacuum is as nothing, for by the "*clean*" working of the boilers (and they are indeed beautifully so, maintaining all their original freshness) a revolution both in form and construction of those necessary appendages will be superinduced not heretofore practicable on account of the water's impurity, when high-pressure steam may be generated, as regards personal risk, with as much impunity as the collaps-

ing of a locomotive flue-tube. Hence all the advantages derivable from working steam "expansively" to the "*full extent*" are placed within our reach; which will facilitate the extension of steam navigation to double the distance now performed, without increasing the consumption of fuel, or afford the means of adding probably 50 per cent. of cargo in a transatlantic voyage. In fact, with fifiy feet of heating surface per horse power, contained in a boiler of less weight, and occupying not above one-half the present area, together with a slow rate of combustion and a "proper application" of the expansive principle in a suitably adapted engine, the consumption of fuel would not exceed 3 or 3½ pounds of fuel per horse.

I cannot help briefly adverting, before I conclude, to the subject of expansion. We are told that they expand considerably already in marine engines. This we know, and likewise too that it is to very little advantage; for, on examining the top of the *British Queen* it will be found that, by taking the absolute number of strokes performed, the consumption of fuel is actually much nearer seven than six pounds, and therefore double what it ought to be if the principle were properly applied and carried to the "full extent."

The fact is, that a great part of the advantage which might be derived from the expansion of even low-pressure steam is sacrificed by the mode of working, which is by varying the amount and even relinquishing expansion altogether when the maximum power is required; consequently when the greatest quantity of fuel is being consumed no saving whatever is effected. But if expansion is not wholly abandoned, the effect of reduction will be the same to a degree. For instance, take steam of high-pressure, say of 50 pounds above vacuum, and allow it to expand six times, the mean effective force will be 23 pounds per square inch. Now steam of the same pressure cut off at one-third of the stroke will have a mean of 34·9 per inch; but as here is double the quantity of steam expended, we must take twice 23 or 46 pounds as the mean effective force produced by an equal volume of steam when expanded six times. So that by cutting off steam, even at one-third instead of one-sixth of the stroke, in order to increase the power of the engines, occasions a sacrifice of about 25 per cent. of the power; which proves that the mode of varying the power of the engines by modifying the amount of expansion is erroneous in principle.

To obviate this, make the cylinders so capacious that the engines with a given pressure of steam and the utmost amount of expansion, shall exert their maximum power, and any reduction from this that may be desirable when circumstances are favourable can be obtained by checking the rate of combustion, and lowering the pressure, thus, with six expansions, and a pressure of 50 pounds, the steam would flow into the condenser at about eight pounds, and if the power of the engines were reduced one-half by working steam of 25 pounds, this would enter the condenser after expanding to six times its volume at about four pounds above vacuum.

The engines best adapted for working out this principle to the full extent, appear to be those of two cylinders from their equalising the power more nearly than can otherwise be well done. If six expansions were effected in one cylinder, the power would of course vary from six to one; whereas, by employing two, the difference would amount to only about two-thirds, and with a pair of double cylinder engines in a ship acting on cranks at a right angle to one-tenth less than a half.

I will now close this paper by observing, that the inferred superiority of the *Great Western* engines to the *British Queen's*, from the mere circumstance of the time each vessel occupies in performing the transatlantic voyage does not appear to be warranted for the comparison from the difference of size, of mould, &c., is far too vague to justify such a conclusion. The disparagement heaped upon the *British Queen's* engines however, does not, I am persuaded, arise from any sense of their inferiority, but may be attributed to other causes into which I will not enter.

I remain, Sir, most respectfully,
Your humble servant,
ALPHA.

Limehouse, September 10, 1840.

Postscript.

Sir,—I wish you to add by way of P. S., that long since my paper, which you recently stated was in type, has been in your hands, I have been on board the *British Queen*, and find that there is scarcely an observable undulation of the mercury in the gauges which confirms the theory therein laid down—such being the consequence of a very near approach to a Torricelian vacuum and a rapidity of condensation equal to the velocity of the steam flowing from the cylinder.

With regard to the originality of employing small copper tubes for the purpose of surface condensation, I have to state, that I do not know how long such means might have been in use, but this I do know, that being in Scotland in the year 1828, a gentleman and the writer had some conversation on this important matter, and the best means of effecting an object so desirable in every point, if the thing were practicable at all. The result was, that half inch copper tubes were sent for, but I left for London before they

were applied. On the 2nd of February, 1830, however, I met the gentleman in town, when he informed me "that his experiments on condensing by external cold were tried with an injection engine of 7½ horse power that had been driving machinery for a considerable time at his works; the tubes employed were ½ inch, as before stated, and 1600 feet long; the change he observed materially relieved the engine, saved one-fifth of the fuel, and no more water was used than with the old plan, the water running away from the top of the apparatus at about 120 degrees, a temperature much greater than the water resulting from the condensed steam discharged by the air pump," I have extracted this from a memorandum made at the above date, since which several steamships have been built and fitted up with condensers of the same kind at the works alluded to.

ALPHA.

Nov. 25th, 1840.

CONDENSATION.

Sir,—Want of leisure caused me to delay for a short time again addressing you (as I intimated in my letter to you of the 19th September was my intention) on the subject of the essential difference between Mr. Samuel Hall's system of condensation and that of Messrs. Howard and Symington; and my delay has been further increased by Mr. Fox's letter to you on the same subject, which is so excellent and so much to the point, that I admit that many of my observations are anticipated by that gentleman; so much so, that I should not have troubled you with any further remarks had not Messrs. "Tom, Dick, or Harry," and "Scalpel," thrown in your last Number so much dust into the eyes of your readers as to make me think it desirable to brush it away. "Scalpel" admits that he reasons *à priori*, and I have no doubt but "Dick, Tom, or Harry" will admit that they do the same; whereas it is quite clear that Mr. Fox reasons *a posteriori*, which must give him an infinite advantage over his opponents; and I feel quite convinced that his clear and candid narrative will bring more thorough conviction to the minds of all *unprejudiced persons* (to adopt the term you extract from the *United Service Journal*), than I can at all hope to do, especially if those minds be imbued with a masculine knowledge of science in addition to their being *unprejudiced*. I would ask you, is it not surprising that any one, although a mere dabbler in scientific matters, should be so short-sighted as not to see the ease with which 13 gallons per minute of water, at 212°, may be cooled to a low temperature by a small quantity of metallic surfaces in contact with cold water, compared with the performing of that operation upon 1200 gallons per minute, although it be of a temperature of only 100° from which it has to be cooled? Is it not quite clear that the rapidity of the process of abstracting heat from water through metallic surfaces depends upon the difference between the temperature of the water to be cooled and that of the water for cooling the same? If the former, for instance, be 212°, and the latter 52°, the difference between them being 160°, will not the abstraction of the heat be infinitely more rapid than if the temperature of the former were only 100°, and that of the latter 52°, whereby the difference in the temperature between them is only 48° instead of 160°? I contend, therefore, that "Scalpel" is quite wrong in his philosophy when he says "there is nothing why Mr. Symington cannot reduce the temperature of 1200 gallons from only 100° to 60° (i.e., in one minute), as well as Mr. Hall can 12 gallons in the same time reduce 13 gallons from 225° (he should have said 212°) to 60°." He commences his paper by saying neither "R. S. M." nor "Honestometer," ("in whose last, by the way, is a terrible mistake, and who will not see what is plain enough to two other writers.") Why does "Scalpel" accuse me of making a "terrible mistake," without pointing out what it is? He next, after approving of the *tone* and *manner* of Mr. Fox's paper, says, "This gentleman (basing his decision upon Mr. Hall's experiments, which, in my opinion, are very inconclusive, and were not conducted with that talent which certainly belong to him) asserts that the doing of that which Mr. Symington and Mr. Howard propose is totally impossible." How "Scalpel" gets his information to enable him to form an opinion that the experiments of Mr. Hall were not conducted with his usual talent, I am not aware, for there is not anything in Mr. Fox's letter to justify his jumping at such a conclusion. "Scalpel" says, "I believe that among *scientific* men the *fallacy* of Mr. Hall's condensation is now pretty well admitted." I am sorry that I cannot return the compliment which "Scalpel" paid to Mr. Fox respecting the *tone* and *manner* of his last as well as his preceding papers in the *Mechanics' Magazine*. The discussion of scientific subjects certainly requires no such gross personalities as those in which "Scalpel" has indulged toward Mr. Hall from the very commencement of his correspondence with you. Now I would, if it were possible, avoid mentioning the name of "Hall" in this discussion, but I cannot in justice to that gentleman do otherwise. May I therefore beg to ask "Scalpel" whence he derives his belief "that among

scientific men the *fallacy* of Mr. Hall's condensation is now pretty well admitted?" Who are these scientific men, let me ask? Are they the intelligent writers in the *United Service Journal*, to one of whom "Scalpel" alludes as having inserted a paper on Steam Navigation in this month's Number of that work? or are these scientific men the engineers who made the engines with Hall's condensers on board Her Majesty's steam-ship *Megara;* the Hon. East India Company's vessels the *Zenobia* and the *Queen of the East;* the *British Queen* transatlantic steam-ship; the Oriental steam Co.'s ship *Wilberforce;* and the India Steam-ship Company's ship *India, cum multis aliis?* These vessels, all of the very first class and size, have been too many years in most perfect operation in the Mediterranean, in India, and the Atlantic, to enable any one, even with "Scalpel's" *powers*, to injure the reputation of Hall's condensers, or to induce a single *scientific* man to believe for one moment that they are *fallacious.* If the above named gentlemen are not the scientifics to which "Scalpel" alludes, perhaps they are "Scalpel" himself and his compeers, "Harry, Tom, or Dick," "A. B. or C.," &c. &c.

I will now notice "Scalpel's" sarcastic appeal to Mr. Fox, in the following words: "Talking of increase of power by the way. How could you, Mr. John Fox, in your celebrated letter to the Admiralty, tell them of an increase of power of one-fourth, besides the saving of fuel by the use of these said 'perfect' condensers." To what extent there is an increase of power and a decrease in the consumption of fuel by the supplying of pure water to the boilers of marine engines, and from the numerous advantages resulting therefrom, I will not pretend to say, but I must observe, that it is somewhat singular, that in your 900 Number, "Dick, Harry, or Tom," claims even more economy of fuel by Mr. Symington's condensers than Mr. Fox does by Mr. Hall's. The following are the words of that three-fold gentleman when speaking of the engines on board of the *Dragon.* "I saw the coals weighed, and counted the revolutions, and carefully took down the results, there was a saving of fuel of *more* than a fourth with S.'s plan." "Harry, Tom, or Dick" seem to speak of the plan of Mr. Symington's system of condensation having been applied to the *Dragon* four years ago, as if it gave him the priority of the invention; whereas, Mr. Fox states, that Mr. Hall applied the self same plan in the year 1832, or eight years ago. Now, if Mr. Hall gave up the thing as practically impossible, and Mr. Symington have brought it to perfection, then let him have the merit ascribed to him of having done so, and if Mr. Hall begrudge him that merit, he is not the man that (from what I hear of him) I take him to be, "Dick, Harry, or Tom" proceeds thus: "About 18 months ago I was on board the *Dragon*, saw Symington's plan tried for two consecutive hours without any mixture of external water," who disputes that such might be done, but my fellow labourer in the vineyard, Mr. Fox, states that the engines "never for one consecutive hour *worked up to their full power.*" The last part of the statement is omitted by "Harry, Tom, or Dick," and I am quite convinced, that Mr. Fox is correct, and join him in challenging any person to prove to the contrary, and in so doing, I disclaim making personal or invidious attacks, as my intention is only to advocate the cause of truths of science, which no person, howevever interested or *prejudiced* he may be can overturn. I have a good deal more to say upon this important subject, but I must defer it to another time, and this letter, indeed, you may perhaps consider already too long.

I remain, Sir,

Your most obedient servant,

HONESTOMETER.

N. B. This has been written a week ago, but my being from home prevented my sending it.

November 16.

SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—A sense of duty to myself obliges me to notice an article in Number 901 of your Magazine, wherein Mr. Howard states that he has "hitherto thought proper to be a silent observer of the many remarks made in your journal on his system of condensation by reinjection, but a sense of duty to myself causes me to write." He then goes on to say, "Allow me boldly to *assert*, that either your correspondent 'Tom, Dick, or Harry' has been most shamefully imposed upon by my plan of condensation, or that he himself is attempting to impose upon others;" and that "he for one should be ashamed to practise, or hope to benefit by the practise, of such deception."

Now, Mr. Editor, there is one thing in my favour; that is, Mr. Howard has merely *asserted* all this, and till such time as that gentleman can prove his assertions to be correct (which will be rather an arduous task for him), he must not feel displeased if but little credence be given to them; for notwithstanding his boast of having "had no little practice on the subject," he has now had four years to examine the specification of my plan of condensation, and as yet seems quite unacquainted with its principle.

It is a pity that while Mr. Howard was so rashly imputing base motives to others, a

sense of duty to himself could not have kept him above suspicion, for most assuredly it is evident from his own showing, that he must have either been deluded, or that he himself has most shamefully attempted to delude others. I have heard Mr. Kingston repeat, on board of her Majesty's steam vessel *Alban*, that if Mr. Howard did all that he said he could do with his plan of vaporisation, it would be one of the greatest improvements hitherto made on the steam engine; for it would save above one-third of the usual quantity of fuel, and that no boilers were needed, besides many other important advantages. In addition to this, Mr. Howard states in your journal for 1836, "that his principle or process answered perfectly on board the *Vesta*." He now tells us, in your Number 901, "his plan of vaporisation has proved defective in some practical points, after many attempts on the great scale more or less successful."

I leave Mr. Howard calmly to reflect whether he has acted fairly towards an individual who has never attempted, in one single instance, to injure him; at the same time to remind him that he has already made one public apology to me for a hasty assertion.

I am, Sir,

Your most obedient servant,

WM. SYMINGTON.

Wangye House, Essex, Nov. 25, 1840.

NOTES OF A READER.

Daily Coaches in 1593.

"At Hamburghe Gate, leading to Lubecke, we found a dogge that followed vs; and some passengers of credit assured mee, that for yeeres this dogge had lien at that gate, and euery day without intermission, watching the first coach that came forth, had followed the same to the village of Attslow, being the bayting place at noone, and after dinner had returned back to Hamburghe Gate, with another coach coming from Lubecke, for coaches passe daily between those cities."

Umbrellas in Italy in 1590.

To avoide the beames of the sunne, in Italy they carry Vmbrels, or things like a little canopy over their heads, but a learned physician told me that the use of them was dangerous, because they gather the heate into a pyramidall point and then cast it down perpendicularly upon the head, except they know how to carry them to avoid the danger."

A Sawing Mill in 1593.

"Between Reichstat and Alstat, near Dantzyke, is a mill which, in my opinion is very rare; it is driven by a river, and without the help of hands saweth boords, and having an iron wheele, which doth not only draw the saw, but hooketh in and turneth the boords to the saw."—*Moryson's Travels*, 1593.

Sedan Chairs.

Sir S. Duncomb, predecessor to Duncomb Lord Faversham and Gentleman Pensioner to King James and Charles 1st, was the person who introduced sedan chairs into this country, A.D. 1634, when he procured a patent which vested in him and his heirs the sole right of carrying persons up and down in them for a certain sum. Sir S. Duncomb was a great traveller, and had seen these chairs at Sedan, where they were first introduced.

Hindoo Corn Mill.

"Two women were seated on the floor, a granite stone between them, twenty inches or two feet in diameter, hollowed out to the depth of several inches; within this was placed a smaller stone of the same description, furnished with a handle and perforated in the centre; through the hole the grain was conveyed, and by the handle the women turned the mill. By this simple process they prepared the flour which was required for their families."—*Massie's Continental India*, vol. 1. p. 129.

Malleable Glass.

"'Pliny, Petronius, Isidorus and others report, that an artificer was presented to Tiberius who had invented a malleable glass, which being cast on the ground, was bent but not broken, and being taken up by the same artificer, was with his hammer brought to the former form and beauty. His reward, besides the wonder and astonishment of the beholders, was that which precious things' often procure their owners—for the Emperor asking whether any other knew this mystery, this being denied he caused his head (the only workhouse of this secret) to be smote off, lest gold and silver should give place to art."—*Purchase's Revelations of the World*, London, 1617, p. 901.

Geneva Fire-Escape.

"It is surprising the fire-escape used at Geneva has not been more generally adopted; it may be raised in two minutes to the highest story of a house; a large sack is attached to the upper extremity into which the person in danger is to place himself, its weight in descending raises another to rescue more lives. The Emperor Alexander applied for models of the machine, and it pleased him so much that he sent presents of superb rings to the mayor, the inventor, and the artist who made the drawings."—*Memoirs of the Empress Josephine*, p. 126.

Cutting Timber under Water.

"We passed along several reaches without meeting any impediment, but at length

an accumulation of drift timber and gravel brought us up at a spot where two large trees had fallen across the stream from opposite banks. The sailors swam about like frogs, and swimming divided with a cross-cut saw, trees under water." — *Mitchell's Eastern Australia*, vol. 1, p. 55-6.

Thrashing Machine not modern.

"A gentleman at Dalkeith, in Scotland, has invented a machine for thrashing grain which gives 1,320 strokes in a minute, as many as thirty-three men thrashing briskly." —*Gentleman's Magazine*, February, 1785.

R. W. D.

NEW PUBLICATIONS.

Essay on the Productive Resources of India. By J. F. ROYLE, M.D., F.R.S., Professor of Materia Medica, King's College, &c., 8vo. pp. 451. London, Allen and Co.

Whatever may be the results to England herself of the career of never-ending conquest and aggrandizement to which she seems by some unhappy fatality to be committed in the East, it is hardly to be denied that so far as the countries which have fallen under her sway are concerned, most, if not all of them, have been great and lasting gainers by the triumphs of her arms. An impression very generally prevails that until recently—no farther back indeed, than the abolition of, the East India Company's monopoly—our merchant-warriors looked to the sword alone, and to the harvests of the sword's reaping, for a good balance in their ledgers. But the archives of the India House furnish honourable evidence that at no time within the last century have the Company been indifferent to the internal improvements of the countries successively subjected to their dominion—to the cultivation within them of those arts of peace by which the ravages of war might best be repaired—while a vast increase of valuable produce exists to attest the success of their beneficent efforts. Of late, indeed, the subject of the "Productive Resources of India," has attracted a much greater share of interest than it has ever heretofore done—of which the well-timed and instructive Essay before us is perhaps as striking a proof as any—but this comes merely of that general ardour which has happily sprung up amongst us of late, to make all the ends of the earth partakers in the benefits of our advanced state of knowledge and science, and to place our greatness as a people on that broadest and most enduring of all foundations, success in the diffusion of the blessings of Peace and Plenty, Civilization and Refinement.

The Essay of Dr. Royle divides itself naturally into two parts, (though not so divided in point of fact); the first showing what has been already done to cultivate the "Productive Resources of India," and the second, what yet remains to be done.

A few extracts from those parts of the book assignable to the former head of its subject, will serve to show that India has been by no means that neglected field which people commonly imagine.

Indigo is a native product of India (as is proved by its name, which is but a corruption of *Indico*, the name by which it was known until recent times in European commerce, and that an abbreviation of *Indicum*, as it is called by ancient authors,) and it forms now one of its staple and most valuable exports. But there was a period in the early history of the East India Company, when the indigo of the East was, in consequence of an inferiority in its mode of manufacture, completely supplanted in all the markets of Europe, by the indigo of the Spanish, French and English possessions in the western hemisphere. It was under these circumstances that

"——about 1779-80 the Court of Directors of the East India Company made extraordinary efforts to increase the production of indigo, and to improve its quality, foreseeing that if they succeeded the result would at once be highly advantageous to India and beneficial to this country. A contract, at prices which were intended to encourage the growth, was therefore entered into with Mr. Prinsep, who at this time considered that India might supply Europe with sugar and cotton as well as indigo; and for a supply of the latter they continued to make other engagements of a similar kind until 1788. But, on reviewing the issue of all the sales prior to the year 1786 it was ascertained that the several parcels yielded a remittance of only 1s. 7d. 67 dec. for the current rupee, which was a loss in the first instance of upwards of seventeen per cent., independent of freight and charges, which may be reckoned at full 10 per cent. more.

"In 1786, several contractors delivered in indigo, which was sold in London; of this, that supplied by Mr. J. P. Scott was the only parcel which yielded a profit, and this to the extent of 11d. 01 dec. per pound. Notwithstanding this, the losses upon the aggregate of the above consignments were very considerable; as that which stood the Company in—

"Cost and charges	£30,207
"Produced only................	21,596

"So that there was a loss of £8,611 or equal to twenty-eight per cent.

"Though these losses had been sustained important results were the consequence.

Europeans acquainted with West-India methods having proceeded to Bengal, considerable improvements took place in the manufacture of Indigo. Some transmitted by Mr. Boyce, even so early as 1787, was pronounced by a competent judge in London, 'equal to Spanish 9s. 6d. to 10s. 6d. the pound the second sort.' From the proved practicability therefore, of making superior kinds of indigo, and contrasting this with the inferior qualities of that sent from Bengal, as well as the high prices at which it was tendered, the Court came to the determination that the Company should cease to purchase for at least three years. This it was supposed, would have the effect of increasing competition among individuals, and would not 'fail to operate in bringing the article to its greatest possible state of perfection;' at the same time the lowest rate at which it was possible to be manufactured would be ascertained.

"To insure due attention being paid to all parts of the process, and to afford the requisite facilities for attaining success, instructions were sent out concerning the mode of manufacture, as well as directions respecting the square forms in which it was desirable that the indigo should be sent home. Specimens also of the good kinds which it was desirable to rival, were sent to India, and also the reports of the dyers and brokers on the several samples which had been successively transmitted from India. Besides this, some of the duties were remitted for the seasons of 1789 and 1790, and relief also afforded both as to tonnage and freight. Advances were likewise made by the Government to some manufacturers, and 'as a further aid,' the Company made large advances of money secured on the indigo, on a plan of remittance to London, and this course was followed for many years.*

"It is extremely interesting and instructive to find these measures followed by rapid improvement in the quality of the indigo. It is stated in a letter of the Court of Directors of the 30th of May, 1792, 'It affords us much pleasure to remark that the article, as to quality, is still increasing in reputation. It has already surpassed the American and French, and there is no doubt but by perseverance and attention on the part of the planters, it will effectually rival the Spanish.' In fact a parcel of five chests, belonging to Messrs. Gilchrist and Charters, was declared to be superior to Spanish, and was sold at a higher rate; while the buyers deemed it to be possessed of every requisite that could be wished. By the accounts of the quantities of indigo imported into great Britain during ten years, ending in 1791, it appeared, that in proportion as the imports from Bengal increased, there was a diminution from other parts.

"From the success of the culture it was prosecuted with undue vigour, as this, in the year 1795, caused an importation of 4,368,027lbs., of which the consignments from Bengal alone amounted to 2,956,862lbs. From this immense quantity being thrown into the market, and from four-fifths of it being of a very inferior quality, a considerable reduction in price ensued. The fluctuations continued to characterise the commerce of indigo, and this not only for the above reasons, but also because the consumption of indigo depends upon the condition and progress of other manufactures. The reduction in price was at no time more remarkable than between 1824-25 and 1829-30, having been 11*s.* 5¾*d.* a pound in the former, and 4*s.* 3¼*d.* in the latter. But the trade increased gradually to a great extent, as no less than 9,913,010lbs. were imported in 1828, though not more than 6,545,873lbs. in the year 1837; of these importations *ninety-four per cent. was supplied by India.*

"Few histories of commercial products are more instructive than that of indigo, which we see an article of export in the earliest times, from the country where the plant is indigenous. It formed one of the principal articles imported by the East India Company in the first century of their commerce, but was soon supplanted when European skill was applied to the culture of the plant; and the manufacture of indigo in the West Indies and southern parts of North America. It was restored again to the country of its birth by the very means by which it had been wrested thence, that is by the application of European skill and energy, as well to the culture of the plant as to the chemistry of the manufacture. Accurate information was also supplied, and specimens of the quality of drug it was desirable to rival.

"But all these would hardly have sufficed had it not been for the extensive purchases made by the East India Company, the losses which they sustained, and the advances which they still continued to make. The manufacturers eventually attained a degree of skill, which in a climate favourable to the plant, and backed by cheapness of labour in Bengal, enabled them to bid defiance even to the more practised manufacturers of the West. The culture and manufacture being established, indigo has continued one of the staple products of Bengal. Its goodness is permanently secured by the planters in Bengal and the south-east provinces attending to the culture of the plant and the manufacture of the indigo, while those in the north-western parts of India supply them with seed. The

* "Vide 'Report of the Proceedings of the East India Company in regard to the Culture and Manufacture of Indigo.' p. v."

moisture and richness of the Bengal soil and climate are favourable to the luxuriant growth of the parts of vegetation, in which the colouring matter is secreted, while the comparative dryness of the northern provinces enables them more easily to perfect the parts of fructification."

Not very dissimilar is the history of "Silk Culture in India."

"In India the silk culture flourished only in the southern parts, that is in Bengal; and all the East India Company's filatures were confined to that province, and did not extend beyond 26° N. lat. Silk has long formed an article of commerce from India, but in inconsiderable quantities before the middle of the eighteenth century. It was, moreover, very inferior in quality, 'being wound from the cocoons, and reeled into skeins after the rude manner immemorially practised by the natives of India' and which is now distinguished by the name of '*country wound*.' It fell into so much disrepute that the Court of Directors informed the Bengal Government, that unless the defects could be rectified, the Company must abandon the exportation of it to England.*

"The Court were induced, in the year 1757, to send Mr. Wilder, 'a gentleman who had the reputation of being perfectly acquainted with the culture and preparation of silk in every stage,' out to Bengal. He remained in India till the time of his death, in 1761, and laid the foundation of great improvements in the winding of the silk. 'Subsequently to the acquisition of the Dewanee, the cultivation of the mulberry was recommended in the strongest manner to the Zemindars and landholders, and all possible encouragement afforded for the clearing of such lands as would best answer for the purpose.' 'The Government also was directed to make such deductions from the rents of the lands planted with it, as should have the effect of a bounty in its favour, and render it more profitable than any other kind of culture.' By these means a very great increase took place in the importations of silk from India.

"But hitherto the better modes of preparing the silk had been but partially successful, and as 'considerable dealers and manufacturers had given it as their opinion that the staple of the Bengal raw silk was equal to that of the Italian or Spanish, and capable of being used for all purposes—if reeled in the same manner,'—it was determined in 1769, 'to introduce into Bengal the exact mode of winding practised in the filatures of Italy, and other parts of the Continent.' For this purpose several Englishmen and foreigners, as Messrs. Wiss, Robinson, and Aubert—and others as drawers, winders, reelers, and mechanics—were retained for the purpose of proceeding to India. It was also determined that the method of spinning and drawing the silk as practised at Novi,* in Italy, was to be adopted throughout all the filatures. The first silks prepared by the Italian method were sent to the Court of Directors in 1771, and reached England, 1772. The report which was made here on their arrival was, that 'Mr. Wiss had succeeded to admiration in drawing a tolerable silk from the most ungrateful cocoons that the sickliest worms under the most unfavourable proceedings could produce; that the coarse silks could not be much improved; that it was the finer sizes that required reformation, which, if accomplished, the Company would view the advanced price and eager demand for it with astonishment.'

"About this period the Bengal government applied for, and received from China a quantity of the China silk worms, as well as mulberry plants, which were planted in the Governor General's garden. It is unnecessary to follow the history more minutely, as it has been shown that the introduction of the Italian method of winding silk in Bengal may be dated from about the year 1770, but it was not until 1775 that the new mode could be considered as in full operation. In the intermediate period much time was unavoidably taken up in erecting buildings, fitting up furnaces, reels, &c., and in instructing the natives, whose long established prejudices it was difficult to remove, so scrupulously averse are they to innovations of any kind.'

"The result of the successful efforts for improving Bengal silk was quickly seen by the decline of importations from Aleppo, Valencia, Naples, Calabria, and other places in the Mediterranean, so that in a very short period the whole of the silks used in this country were furnished only from the northern provinces of Italy, from Bengal, and China.

"In the deficiency of the supply of hemp from Russia, and in that of sugar from the West Indies, we have seen that India was looked to, to relieve the wants of the British public. So in 1808, when the decrees of Napoleon occasioned an entire cessation of the customary importations of Italian raw silk into this country, the silk trade held a meeting at Weaver's Hall. It was then resolved unanimously, 'That Bengal silk has become highly necessary in many branches of manufacture, and that from experiments lately made, it is found fit for purposes to

* Report of the Proceedings of the East India Company in regard to the Trade, Culture and Manufacture of Raw Silk. London, 1836.

* Various tools, implements, and models, manufactured in London and at Novi were forwarded to Bengal for the use of the establishments.

which it had not before been thought suitable." "That it was highly desirable that its quality should be further improved, and that a greatly increased quantity should be brought over." A committee was also appointed to confer on the subject with the Chairman and Deputy Chairman of the East India Company.

"In consequence of this, orders were sent to the Bengal government to adopt all possible means for increasing the supply of silk, and to arrange, as soon as circumstances would admit, that the whole of it should consist of the filature wound class. Instructions for reeling silk were furnished by Mr. Wiss,* and these were sent out to Bengal, and directed to be supplied to the residents at the several silk aurrungs, and to be translated into the native languages for the information and direction of the native servants who are entrusted with the care of the minor establishments. The Indian Government was also recommended to consider whether it might not be practicable to a certain extent to establish mulberry plantations on its own account.

"To remove uncertainty respecting the exact sizes of filature silks required, the Court transmitted to Bengal sets of regulating specimens, with directions that the silk should in future be manufactured strictly in conformity with them. Specimens of the cocoons reared in the vicinity of the several factories were also required, with reports on the varieties of the Bengal silk worms by the different commercial residents. The commercial resident at Santipore having suggested that a certain quantity of mulberry-land should be cultivated and that the silk worms should be reared and the cocoons formed under his immediate superintendence, his recommendation was sanctioned both by the Indian and Home Government. The experiment was continued until 1830, but the silk was not found improved in proportion to the expense incurred.

"From the foregoing cursory view of the means adopted for improving the silk culture of India, we observe that there, as in Europe, improvements have generally, if not always, been urged upon cultivators by the influence and expenditure of the government. In later periods of the history of nations, individuals are sufficiently well informed to adopt suggestions for a prospective advantage; though this is never found to be the case, nor indeed can it be expected in nations less advanced in civilization.

"The result of the measures which had been adopted were, as we have seen, firstly, great improvements in the silk of Bengal, and secondly, the quantity imported into England was increased, *from* 401,445*lbs. in* 1792 *to* 1,387,754*lbs. in* 1829, though in subsequent years it was somewhat less.

"The culture of silk though susceptible of further improvement, having succeeded to so great a degree in Bengal, ought to afford the best encouragement for the ultimate success of other cultures. Many of these are not more hopeless than that of silk appeared when the East India Company determined upon attempting its improvement. In fact, any difficulties must be fewer in number and less in degree. For in that we had not only to procure the animal which was to prepare the silk, but also the leaf upon which it was to feed; and thirdly, a climate was required, suitable both for the growth of the vegetable and for the healthy existence of the animal."

A still more striking instance perhaps than either of those we have quoted of the beneficial influence of the Company's Government on the internal character of the country, is to be found in the following extract from a charming account of the celebrated Botanic Garden of Calcutta:—

"The result now is that a complete change has been effected among the inhabitants of Bengal with respect to their gardening. Country seats have risen in all directions, gardens have been attached to the houses in town, in the suburbs and on the banks of the river, both among natives and Europeans, all replete with the choicest fruits and flowers. Similar improvements have taken place in many parts of the interior of the country. The share which belongs to the garden in producing this amelioration is evident, from this fact, that scarcely a garden exists in Bengal, certainly not within 20 or 30 miles from Calcutta, that has not received supplies of plants from it; besides large collections being transmitted to all parts of Hindostan. Such is the difference of feeling in this respect among the natives of the country, that it is gratifying to find that for one man who used to ask in former times for plants there are now ten applicants; and these chiefly among the middling classes both of Hindoos and Mahomedans.

"Among the useful trees which have been distributed, many hundred thousand timber trees, some indigenous in the country, and others introduced from congenial climates, besides their seeds, may be enumerated. Amongst them the teak, mahogany, logwood, and casuarina, hold a conspicuous place, and numbers of these may now be seen grow-

* Mr. Wiss having returned to England was presented by the Court of Directors with 1,000*l*. for the assiduity and skill with which he had established the Italian mode of winding at one operation from the pod. He was also appointed silk superintendant, and "continued in the Company's home service for many years, and was eminently useful in furnishing the Resident in India with suggestions for improving their silks." Report, page xvii.

ing in great luxuriance in the northern provinces, at least as far as 1000 miles from Calcutta. The teak is of slow growth, requiring from 60 to 80 years to attain the proper size and maturity for ship building; but Dr. Wallich states that the large trees in the Calcutta garden are equal in size to the generality of those of probably similar age which he saw in the forests of Martaban, and little inferior to them in the quality of their wood. The mahogany grows as well in Bengal as in its native country, and though inferior in fineness of grain to the best kinds, it is at least equal in quality to that of Jamaica. Of the native woods there are a great variety, and of every quality, which it is unnecessary here even to mention further. To bring as many as possible of these into general cultivation has been, and must always be, one of the primary objects of the institution.

"The garden has likewise been extensively beneficial to the country in the distribution of fruit trees; a fact best proved by comparing the quantities that are annually sent from thence, with the manifest improvement that has taken place in the fruit markets and gardens. Not only have the indigenous plants been improved, but foreign fruits of various kinds have been introduced, as the sapota, Otaheite apple, alligator pear, litchee, loquat, wampee, mabolo. Besides, the guava, custard apple, soursop, pumplemoose, pine apple, and others introduced at earlier periods with its own indigenous fruits such as the mangoe, plantain, and orange. But it is not to be expected, as some seem inclined to think, that with these, the apple, pear, gooseberry, and currant, will be found growing, as if Calcutta was a temperate climate. Many of the above fruit-trees, such as all the Chinese and West India fruits, were originally introduced into India by the Calcutta Botanic Garden and all the others have been greatly improved.

"The Lansa, a Malayan fruit of very delicate flavour has lately been multiplied for distribution, and even the Mangosteen and Bread fruit trees have so far become accustomed to the climate as to endure the hot weather, and fogs of the cold season without injury. The Nutmeg, which, during many years has existed in the Calcutta garden, and even produced ripe fruit, has by a slight modification of the treatment, become less impatient of the climate. The Cherimolia, a fruit of new Spain, which is described by Humbolt as being of very excellent quality, thrives well in Bengal; but though it flowers annually, it has not yet ripened its fruit.

"As a magnificent garden, laid out in a beautiful manner and stored with the choicest vegetable productions, the Calcutta garden, has during many years been visited by all classes of people for the sake of harmless, rational and useful recreation. Persons of all nations and ranks, both European and natives, resort to it, and are freely admitted, having liberty to walk over all the grounds, and examine every plant and species of cultivation. The garden is accordingly much frequented at all seasons of the year, but more particularly in the hot and cold seasons, during which, on Sundays and holidays, when public offices are shut, and no business is transacted, it is frequently crowded by individuals and families who come down to enjoy a day of coolness, pure air, and relaxation."

The general object of Dr. Royle's Treatise is to show that by like paternal and judicious means to those which have imparted so much prosperity to the Indigo and Silk manufactures of India, there is scarcely any other product depending on soil and climate which may not be cultivated to nearly as good purpose—extending, as the British Dominions do, through no less than twenty-four degrees of latitude (8° to 31° N.) and embracing almost every conceivable variety of elevation and temperature, and in the accomplishment of this object we think he has been eminently successful. The author confines himself strictly to what may be called the physical view of the subject—to those means of improvement which come within the proper sphere of the botanist and agriculturist; leaving untouched, or adverting only incidentally and generally, to those obstacles to the cultivation of the internal resources of India arising from political causes, by which, nevertheless, all the world knows, our fellow subjects of India have been, and still continue to be, great sufferers. The other cultures of which Dr. Royle chiefly treats are, pepper—cochineal—cotton—sugar—flax and hemp—wool—coffee—tobacco, and tea; and on all these heads, as on the others, he has brought together a great deal of very useful and curious information, interspersed with much judicious suggestion and profound philosophical reflection.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

David Gooch, of Paddington, Engineer, *for certain improvements in wheels and locomotive engines to be used on railways.*—Rolls' Chapel Office, Nov. 20, 1840.

Those improvements consist simply in forming the outer or working surface of the tire of engine and carriage wheels of steel, which may be made of any required degree of hardness. The application of steeled tires to wheels used on railways (it is said) has hi-

therto been prevented by the difficulty of forging and fixing them. The following method of surmounting this difficulty is Mr. Gooch's:—

A faggot of wrought iron bars are worked and hammered, or rolled into a solid piece, and afterwards drawn out in rolling, or under the hammer upon an anvil, having a groove to form the flanch, into the state of rim iron. An indentation or hollow is then made lengthwise of the bar near the flanch, in order to prepare it for the reception of the steel. A faggot of steel bars is then so arranged, that when hammered and worked into its droper (wedge) form the edges of the bars shall form the broad surface of the tire. The two bars of iron and steel thus prepared are then welded together, and afterwards formed into a rim or hoop of the form required. The wheel being prepared in the usual way, and its rim turned, it is laid flat on a true face-plate, and the tire being regularly and uniformly heated red hot, is put round it. The whole is then plunged into cold water or other frigorific mixture, which contracts the tire and hardens the steel. Holes having been previously drilled through the steel hoop, are now continued through the rim of the wheel, and both are rivetted together. Or, the rivets may be advantageously dispensed with when the steel is driven well into the indentation prepared for its reception. "Many important advantages," says this patentee, "will arise from the use of steeled tires on railways; besides the economy immediately resulting from the greater durability, a vast reduction will be effected in the wear and tear of the engines, the carriages and the rails; while a corresponding improvement will arise in the comfort and safety of travellers. The intense friction to which the wheel is subjected, occasions a rapid wear and tear of the iron tire, productive of most injurious consequences. An indentation is soon formed by the rails on the tire, which disturbs the action of the wheel, and destroys smoothness of motion. The same causes derange the action of the engine itself; every revolution of the locomotive wheel brings an irregular strain on all the parts, which materially increases the wear and tear to which they are liable. Great damage is also done to the railway, on which the wheels at every revolution act like so many ponderous hammers. It has been found advantageous to make the working surface of the wheels conical, diminishing from the flanch; but the conical surface of the iron tire is soon worn down, and the wheel made conical the reverse way, causing a serious loss of tractive power and increase of friction on all the parts affected. By the use of steeled tires these evils are henceforth to be avoided, the extreme hardness of the surface enabling them to endure without injury the action of the rails for a considerable length of time."

The claim is, 1. The mode described of forming and hardening steeled tires of wheels to be used on railways. 2. The use of steel in the tires of engine and carriage wheels for railways.

We wonder what the several inventors, patentees, and advocates of *wooden tires* will say to all this?

WILLIAM HENRY SMITH, LATE OF THE YORK-ROAD, LAMBETH, BUT NOW OF 20, ROCKINGHAM-ROW WEST, NEW KENT-ROAD, ENGINEER, *for an improvement or improvements in the mode of resisting shocks to railway carriages and trains, and also in the mode of connecting and disconnecting railway carriages; also in the application of springs to carriages.*—Rolls' Chapel Office, Nov. 28, 1840.

The first improvement consists in applying to railway carriages certain combinations of machinery or apparatus, affording an increased length of elastic resisting power, with a consolidated action of the same, calculated to obviate the present liability to danger. The second, a peculiar mode of connecting the engines or carriages, whereby they may be more readily attached to each other, or instantly detatched, thus placing them more completely under the control of the engine-man or conductor, by whom the connection may be broken (without his leaving the foot-plate) in case of the engine getting off the rails or meeting with any other accident; or a solid connection may thus be formed between the carriages, causing a simultaneous action of the whole train upon one point of resistance, thereby lessening the amount of spring or other elastic resistance required, and at the same time ensuring greater safety and efficiency of action. The third, consists in a certain application of the vertical or side springs, by which is obtained in a greater degree an universal action of the carriage, presenting an increased elastic resistance in the direction of the shock, whether lateral or vertical. In the first case, a series of helical or other springs are placed in parallel rows, side by side, beneath one of the carriages; a single buffer-bar extends, by connection, through the whole length of the train, and projects about five feet beyond the carriages at each extremity. This buffer-bar is connected to two cross arms, which abut against the two ends of the series of springs already mentioned. A buffer at the end of the bar receiving any shock, it is transmitted along the bar to the cross pieces impinging on the springs, which present an elastic resistance to such pressure. As these springs can be acted upon from either end, should a collision occur from one train overtaking another, both would, if thus equipped,

be found unhurt, the consolidated resistance in each being brought simultaneously into action. Another mode of resisting sudden shocks is by means of a male screw upon the buffer-bar running along the under side of the carriage frame, having a quick thread "so as to fall by its own gravity," and turn freely in a nut or collar firmly affixed to the carriage. Any shock, it is said, would be transmitted through this collar in a much less degree (proportioned to the angle of its thread). The end of the screw is attached to a strong verge spring, which increases the resistance to the turning of the screw as it is wound up, so as completely to overcome the shock. The screw is acted upon by a buffing bar. "The main value of this part of my invention," observes the patentee, "is, that the spring is affected but in a small degree by the amount of shock endured, its principal portion being received in the collar, and the resistance not increasing in the same proportion against the spring as in the ordinary methods; but by the screw's application, I calculate, five-sixths of the effect of the concussion would be received by the collar (*ergo: by the* CARRIAGE), and the same proportions to any extent." A third method of resisting shocks is by means of an hydraulic apparatus, consisting of a large close cylinder filled with water, placed under the carriage; a piston works loosely in this cylinder, the piston rod passing through a stuffing box, and forming the buffing bar; a passage under the cylinder, which connects its two ends, is closed by a cock. On encountering a shock, the buffer-bar forces the piston along in the cylinder, the water rushing from before it through the open cock, the contracted orifice of which impedes its progress and checks the motion of the piston. As the piston rod is pushed in, a connecting rod passing from it to the cock closes the latter, when the water can only escape by the sides of the piston, thus offering a still greater amount of resistance. The piston is capable of working either way, according to the end of the train from which the shock is received; and owing to the piston not fitting tightly, there will be no liability of it or the cylinder receiving any injury. There is a reacting spring for restoring the piston to its original position.

The mode of connecting and disconnecting railway carriages is by the following arrangement:—A connecting bar is attached to the engine by a pin joint, and kept in the right position by a staple pendant from the foot plate; at the other end of this bar there is a piece projecting upwards. A bell-mouthed aperture is let into the front frame of the tender or carriage, which guides the before-mentioned bar into the recess in case of any variation of the relative positions of the carriages. On pushing the carriage, &c. up to the engine, the bar enters the aperture, pressing down a strong spring until the projecting piece of the bar enters a slot or cavity prepared to receive it, when the spring rises and forms a permanent connection. In order to disconnect the engine, it is only necessary to press with the foot upon a small rod, which, acting on the projection, forces down the spring, and allows the bar to be withdrawn.

The new mode of applying springs to carriages of every description, consists in adapting four sets of helical springs, to work obliquely between the wheel axles and carriage frame, being inclined at an angle of about 40° from each other towards the ends of the carriage. The object of this arrangement is (said to be) to receive the jerk in whatever way it may come, either from the wheels or the buffers, and transfer it to the opposite spring, which together (the one by compression, the other by expansion) present an additional resistance to the action of the shock. These springs have also a double vertical action resisting shocks either from above or below.

GEORGE HENRY BURSILL OF RIVER-LANE, LOWER-ROAD, ISLINGTON, GENTLEMAN, *for an improved method or methods of weighing and certain improvements in weighing machines.*—Enrolment Office, Nov. 28, 1840.

The improvements under his patent apply to all methods, as well as to all instruments, for ascertaining the weight or pressure of solid, fluid, or aeriform substances.

The first of these consists of a cylindrical vessel which fits into a socket upon a stand; within this is another vessel, communicating by a horizontal leg with a third vessel of like form but smaller dimensions. Mercury is poured into these till it stands at the same level in both. They may be made of any suitable material, but well-baked pipe-clay is found to answer best, mercury having less tendency to adhere to that than to any other substance. A piston, or plunger, having a scale pan on its upper part, rises and falls freely in the larger mercurial holder. An open topped glass-tube, which may be closed by a cock or stopper, is fitted air-tight into the smaller mercurial holder; into this tube some coloured fluid of less specific gravity than mercury (as oil, water, spirit, or dilute acid) is poured, until it fills the space above the mercury and rises a little way up the glass-tube. A moveable index-plate, properly graduated, is placed in contact with the glass-tube, the zero point of this scale being brought to an exact level with the top of the coloured fluid. On placing a weight on the scale-pan, the piston will be pressed down, which, displacing a quantity of the

mercury proportional to its bulk, will cause that in the other vessel to rise, and the displaced water or other fluid of less specific gravity resting upon it, to ascend in the tube, indicating by the graduated scale the weight of the displacing body. The rise of the coloured fluid in the glass tube will be greater than the excess of the vertical rise of the mercury in the larger beyond that in the smaller holder, exactly in the proportion in which the coloured fluid is of less specific gravity than the mercury. When water is employed with mercury, there is a range of about one foot in the glass tube for every inch in the mercury holder. In order to preserve the perpendicularity of the piston, it is connected with a parallel motion, consisting of two arms, working on separate centres. A counterpoise of equal weight with the scale-pan and piston, is attached to one of the parallel rods. Instead of one column of a fluid lighter than mercury, two tubes of the united length of the one, each having a separate holder, may be connected with the principal mercurial holder, but at different levels, and by this means an equally long indication may be obtained at a height more convenient to the eye. Another form of machine is shown and described by which heavy as well as very light weights may be ascertained with equal facility and exactness with a very small quantity of mercury; an inclined curved tube, or mercurial holder, closed at the bottom, communicates near its lower extremity with a vertical glass tube, containing some coloured fluid of a less specific gravity than mercury. A steelyard beam is supported by knife-edge centres at one extremity; from the other, a scale-pan is suspended; at a similar distance within the fulcrum, a second pan is also suspended, the glass tube being just midway between the two; between the glass tube and the extreme scale-pan, a curved piston corresponding in form with the mercurial holder is secured by a screw. The scale-pan at the extreme end of the steelyard is for light weights; that nearer to the fulcrum for heavy ones—and the distance between them may be so regulated as to indicate any definite proportional difference—as, for instance, that one shall indicate pounds and ounces, the other ounces and drachms, while one scale or indicator will serve for both.

Another form of machine on the same principle, is constructed with the scale-pan hanging centrically between two vertical tubes and two index-plates, placed apart, so that the weights indicated by the machine may be seen at the same instant by two different parties. In another arrangement, the operations are indicated by the fall instead of the rise of the coloured fluid in the indicator tube. The top of the piston carries a beam resting on knife edges, to one end of which a weight is attached, and near it the piston; from two appropriate distances on the opposite end of the beam, scale pans are suspended, a weight placed in either of which, raises the piston more or less out of the mercury, and proportionally depresses the coloured fluid in the indicator tube. Two self-acting contrivances are described, either of which may be added to any of the foregoing machines, for the purpose of compensating for changes of temperature whenever it is considered needful; these contrivances are applicable to other machines on the common construction, barometers especially.

Richard Freen Martin, of Derby, Gentleman, *for certain improvements in the manufacture of certain descriptions of cement.*—Enrolment Office, Dec. 2, 1840,

The improvements which form the subject of this patent, relate more particularly to those descriptions of cement for which a former patent was obtained, dated Oct, 8, 1834, but are also applicable to other cements, as set forth hereafter. In the former patent, in order to produce certain hard cements, it was directed that gypsum either in its natural state, or as plaster of Paris, or limestone, or chalk, or lime, in the state of powder, should be mixed with a solution of any strong alkali neutralized by an acid, (American pearlash and sulphuric acid being preferred) and that water should be added to the mixture till it was in a fit state for casting or moulding into cakes, and to be subsequently dried and burned, The patentee has since discovered that the said processes may be facilitated and the cost of them reduced in the following manner:—

First, instead of employing alkaline and acid solutions, the acids and alkalis are to be used in the solid state, either added separately or previously combined together, and no more water employed than the materials themselves contain.

Secondly, in certain cases the addition of the alkali, or both the acid and the alkali are dispensed with, and the quantities of these ingredients incorporated in the substances themselves are depended upon, to form the bases of the cements. In carrying out the first improvement, a quantity of pearl-ash is dissolved in water, to which is added a sufficient quantity of sulphuric acid to form a neutral compound; this mixture being evaporated to dryness, leaves the required compound in a solid state.

When it is desired to add the acid and alkali separately in a solid state to the gypsum, chalk, &c., pearl-ash is used and dissolved, or where cements of superior density are required some of the alkaline earths (barytes for instance) are employed. The acid constituent is obtained by using sulphur

or sulphuric acid in combination with other matters, as pyrites and mineral sulphates, or some solid substance containing both an acid and an alkali, as alum, &c.

In this case it is necessary so to regulate the acid and alkaline proportions, as that they shall always exactly neutralize each other. The acid and alkaline matter being provided in any of these ways, is to be mixed with gypsum, or lime-stone, or chalk, in the following proportion:—to any given quantity of either of the foregoing or similar substances, add as much solid alkali and acid as that for every part by weight of alkali (of the strength of the best American pearl-ash) there shall be about 150 parts of the gypsum, &c., or of the gypsum and lime combined in equal proportions. These materials are then to be ground together into a fine and well-mixed powder, which is to be first dried and afterwards calcined in suitable revolving cylinders. By the second improvement, cement may be formed by combining gypsum and lime with a third substance containing or producing an acid; or by combining gypsum and lime alone, without the addition of any third substance either of an acid or alkaline quality. 1. about two parts by weight of gypsum are to be mixed with one part of lime, and for every 100 parts of lime or thereabouts, there is to be added one part of sulphur, or of some substance from which acid is produced, regulating its quantity according to its superior or inferior acid producing qualities. 2. To make a cement from gypsum and lime alone, these are to be mixed in such proportions as that the moisture given off in the process of calcining them together by the gypsum shall be just sufficient to slake the lime.

When the London grey-stone lime is used, about two parts of gypsum are required to one part of lime. In all cases the materials are to be ground and calcined as before stated. The modes of using the cements thus formed is the same as set forth in the specification of the former patent. It is found to be advantageous to use none of such cements in a fresh state.

RECENT AMERICAN PATENTS.

[Selections from Dr. Jones's List in the Journal of the Franklin Institute, for Aug. and Sep., 1840.]

SUPPLYING LOCOMOTIVES WITH WATER. *S. Vail; July* 12, 1839.—The following extract from the specification, in which the references to the drawings are, of course, omitted, will furnish a clear idea of the nature of the invention:—

"My invention is intended to dispense with the reservoir now used at those stations where locomotive engines are to take in their supply of water, into which the water has usually, to be pumped by hand, at great labour; and in which, in cold weather, its temperature is frequently reduced considerably below that of ordinary well water. This object I accomplish by applying the power of the locomotive engine to work a pump or pumps, raising water from a common well, and supplying the tank therewith, by merely driving the locomotive on to the lateral track, where it is to receive its supply of water, and allowing its driving wheels to rest on two friction wheels affixed to a line shaft situated in a pit prepared for that purpose below the track, the peripheries of said friction wheels extending up to the line of the rails, and passing through openings therein, prepared for that purpose. I move the locomotive by means of chains, or other suitable contrivances, so that it shall stand steadily with the peripheries of its driving wheels resting on the above-named friction wheels, which, when the steam engine is started, will necessarily drive the friction wheels, the shaft of which has attached to it the apparatus requisite for working the pump or pumps.

"Having thus fully described the nature and object of my invention, and shown the manner in which the same may be carried into operation, what I claim therein, and desire to secure by letters patent, is the within described mode of working pumps for raising water from wells for the supply of locomotive engines, and which mode of communicating power may also be applied to other useful purposes: that is to say, I claim the placing of friction wheels upon a shaft, below the track of a railroad, in such manner as that the driving wheels of a locomotive engine may be made to rest upon their peripheries, and when set in action by the steam engine, will give motion to said friction wheels, and, consequently, to the machinery attached thereto, substantially in the manner and for the purpose set forth."

VENTS FOR BARRELS, &c. *S. Pike; July* 12, 1839.—This vent is intended to be self-acting, the valve which closes it being opened by the pressure of the atmosphere. It may be said to be in the form of a syphon, with very short legs. The longer leg is furnished with a screw, which screws into the upper side of the barrel; the short leg has a valve within it, which, falling by its own gravity, closes the opening into it. When this is in place, and liquor is drawn from the cask, the pressure of the external air will raise the valve, and air will pass in.

The claim is to "a vent for tight vessels, furnished with a valve, which opens by the pressure of the air when the liquor is drawn, and shuts by its own weight when the drawing ceases, constructed in the manner and for the purposes described."

DRESSING MILL STONES; *S. Trumbull, August* 2, 1839.—The machine which is the subject of this patent is said to be applicable to the dressing, or pecking, of mill-stones, and also to stones of other descriptions.

A round peck-staff is prepared so as to have a steel chisel affixed in one end, and this staff is made to work up and down by hand in a stock, or slide, through which passes a guide rod, along which the stock may be moved back and forth, horizontally. By means of another guide rod, the stock, with its peck staff, may be made to stand either vertically or obliquely. The whole apparatus is to be fixed on a platform, upon which the operator is to stand when using the instrument; and when this is so placed that the chisel will stand directly over, and the guide rod in the line of a furrow, the peck staff is to be worked up and down by hand. The claim is to "the combination of the ways, or rods, the stock, fork, and peck staff, or handle, as described."

The fact is, that there is but very little novelty in this machine; mill-stones have been dressed by similar machines, in which the chisel was directed along the furrows by guide rods, although under an arrangement different from that above claimed.

MACHINE FOR PACKING FLOUR; *J. Banta, August* 2, 1839.—There is, we think, much novelty in the piston of this flour packing machine. The piston consists of a hoop of the proper size to enter a flour barrel, and the circular disk within this hoop consists of six, or any other convenient number of valves, or shutters, which fill up the space between the hoop and the centre, they are hinged by one edge to the hoop, and to the piston rod in the centre, opening downwards, and when closed constitute a flat piston. The piston rod receives a rotary motion, and is also worked up and down by means of a crank, during the time of packing. When this operation is to be commenced, the piston is allowed to descend to the bottom of the barrel which is to be packed; a quantity of flour is then put in above the piston, the rising of this allows the valves to open and the flour to fall through, whilst by its descent and revolving motion, the flour is packed; the operation being continued until the barrel is filled. The piston rod and its appendages are contained within a frame that slides vertically within an exterior frame, or guide posts, and this interior frame is allowed to descend at every stroke of the piston.

The claim is to "the mode herein described of packing flour by means of the piston head with valves, and having a vertical reciprocating and horizontal rotary motion, all as herein described." We see no reason why this plan should not succeed well, provided there is not a tendency in the valves to clog, and with a dry article, like flour, this, probably, will not be the case.

MAKING CLOTH IMPERVIOUS TO WATER, AND ADDING A NAP THERETO. *W. K. Phipps; August* 31, 1839.—"I take a piece of linen, woollen, or other cloth, and laying it on a table, or other smooth and even surface; I apply to it with a brush, or other suitable instrument, a thin coating of liquid cement, or composition, in an even and uniform manner over its whole surface. The cement I use for this purpose, and the one I consider to be the best, is linseed oil mixed by boiling with some kind of drier, as gum shellac, red lead, and litharge, one pound of each to a gallon of the oil; or the oil may be used as a cement without any drier, in which case the cloth will be longer drying. I usually colour the cement of the same colour the nap is intended to be.

"Having thus applied the cement, I take the material of the nap, viz. flock, or the shearings of woollen cloth, the same that is cut off by the cloth dressers in shearing the same, or other description of material, for nap, and scatter it evenly, by sifting or otherwise, over the surface of the cloth, and then let the cement dry. The cloth, when dried, may be dressed in the manner of other cloths, having a nap of similar description.

"I call it talipot cloth. It forms an excellent and cheap material for the covering and lining of carriages, for storm coats, and for various other purposes."

WINDOW BLINDS. *A. S. Grenville; Aug.* 9, 1839.—The claim under this patent is to "the method of opening and closing blinds by means of the combination of pulleys, cords, and sliding blinds, in the manner described."

These blinds are called railway blinds, as they are to run on wheels, or pulleys, in the manner of sliding sashes. There are to be pulleys in the window frames, around which cords pass from the interior of the room, and which are attached to the blinds on the outside of the window. By this arrangement the blinds can be opened and closed without opening the window.

SPARK ARRESTER. *H. Wilton; August* 17, 1839.—The general principle upon which this spark arrester is constructed is the same with several which have preceded it, but with some variations and additions in the combination. The smoke flue is to be surrounded by a casing, leaving a space between the two for the reception of sparks. The cap is to be covered with wire gauze in the usual manner, and in front of it there is to be a funnel-formed opening, to collect the wind which is to drive the sparks back into a conductor leading down to the space between the flue and its case. At the lower part of the chim-

ney there is to be another funnel-formed opening leading into the flue, and, of course, crossing the space between it and the case; this is said to be for increasing the draught of the chimney, which we apprehend it will fail to effect.

The claim is to "the combination of the funnels, prism, and conductor with the ordinary flues, cap, and wire gauze, for preventing the escape of sparks at the top of the chimney; also the funnel in the inner flue for increasing the draught."

A Cattle Pump; *A. Bailey, August 3, 1839.*—We have often remarked, that when we meet with a proposed improvement on pumps, we anticipate but little, as the requisites to a good instrument of this kind are well understood and well supplied. It frequently happens, therefore, that the proposed improvement manifests a want of knowledge on the principles of hydraulics, and of an acquaintance with what has been practically effected. Among the various schemes which have been proposed, that now placed before us is one of the most absurd, as it presents a very troublesome mode of arriving at sure defeat. A cylinder, twenty-eight inches in diameter, and a foot deep, is to be placed in the reservoir from which the water is to be raised: this cylinder, or tub, has a bottom furnished with a valve opening upwards to admit water. A piston is to be made of wood, two inches thick, which, when leathered, is to fit the cylinder. To this is to be attached a hollow tube which is to constitute the piston rod, and through this tube the water is to rise. The piston is to be forced down by causing an animal to ascend an inclined plane, or platform, bearing on the piston rod, and when the said animal retires, the piston is to be raised by means of a weight passing over a pulley. In the tubular piston rod there is a valve opening upwards; the water is to flow into a trough.

The claim is to "the hollow piston rod in combination with the trough, platform, and the piston, cylinder, and valves of the ordinary pump."

This will be a most effectual mode of applying the principle of the hydrostatic paradox to the bursting of the cylinder, or tub, or rather to the destroying of the twenty-eight inch piston of two inches in thickness, and to the forcing out of much more water round its packing than will find its way through the hollow piston rod.

A Machine for Sizing Paper; *W. W. Wilson and C. Dickerman, August 3, 1839.*—This machine is for dipping paper in the sheet into a circular tub, or vat, containing the sizing liquor. Instead of dipping it by hand, the paper is to be held in clamps at the lower end of slides set round, and carried by the revolution of a vertical shaft, the said slides having counter-weights attached to cords passing over pulleys.

"In using this machine, the workman employed in sizing the paper may dip all the respective portions successively without moving from his station, by merely causing the shaft and its appendages to revolve, in consequence of which arrangement a much larger quantity of work may be performed than by the ordinary apparatus."

The claim is to "the placing of such slides in such a manner as that they may be carried round by a revolving shaft in an apparatus constructed substantially in the manner and for the purpose set forth."

NOTES AND NOTICES.

Galloway's Patent Paddles.—An injunction has been obtained against the *British Queen* and the *President* steam ships, for using Galloway's patent paddles. Amicable negociation having failed to obtain compensation, and the example of large steamers using these wheels without license inducing other proprietors to do the same, Mr. Routledge, the assignee of the patent, it seems, felt himself compelled to take this step. The paddles of the *Great Western* are composed of three, and those of the *President* of two front boards each. The latter are fixed one before and the other behind the arm, in the common manner.

The Modern Progress of the Iron Manufacture is by few facts more strikingly exemplified than by this—that formerly it required more than four tons of engine coal for the production of one ton of iron, while, in consequence of the numerous improvements introduced, chiefly within the last thirty years, half a ton only is now the average quantity required; that is to say, above eight times the quantity of iron is obtained from the same engine power.—*Mechanics' Almanack.*

The Abstractions from the Atmosphere by the Iron Blast Furnaces is prodigious, yet to all seeming unfelt. The most copious well may be pumped dry—the largest steam generators exhausted; but what air engine has ever yet made any visible impression on the atmosphere? At the Dowlais Iron Works, where about 1200 tons of pig iron are made weekly, the prodigious quantity of 30,000 tons of air must be withdrawn weekly from the surrounding atmosphere, and passed literally through the "fiery furnace;" yet the void occasioned by this perpetual drain is constantly restored by means unknown to us, and without the smallest inconvenience to those who live and breathe in the same medium.—*Ibid.*

A Pint of Water converted into Two Hundred and Sixteen Gallons of Steam will raise thirty-seven tons a foot high; and if the steam is allowed to expand to double that volume, twice that weight. The greatest load ever lifted by any steam engine in England was by one in the Consolidated Mines in Cornwall, on the expansion principle, which raised a load of 90,000 lbs. seven feet six inches high every double stroke it made, and this nine times a minute.—*Ibid.*

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BURSILL'S PATENT WEIGHING MACHINES.

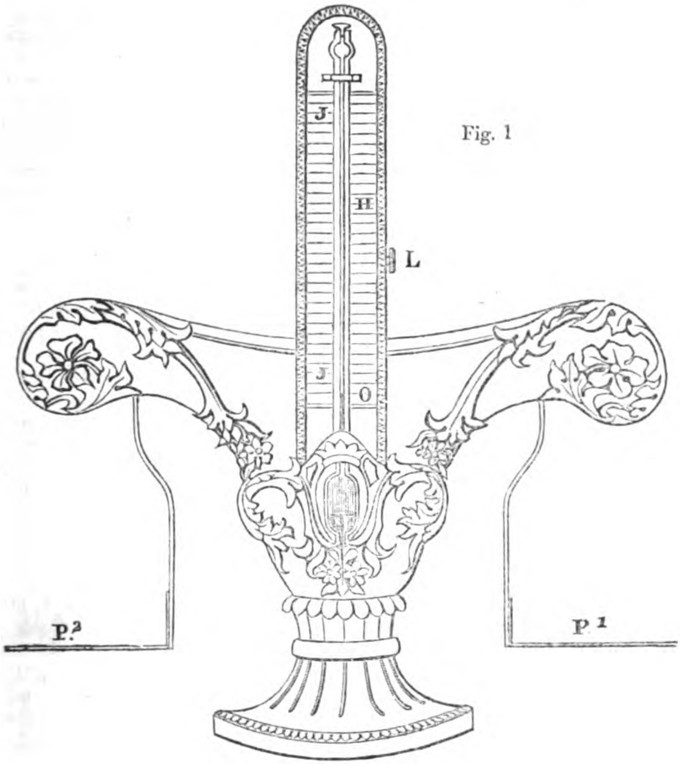


Fig. 1

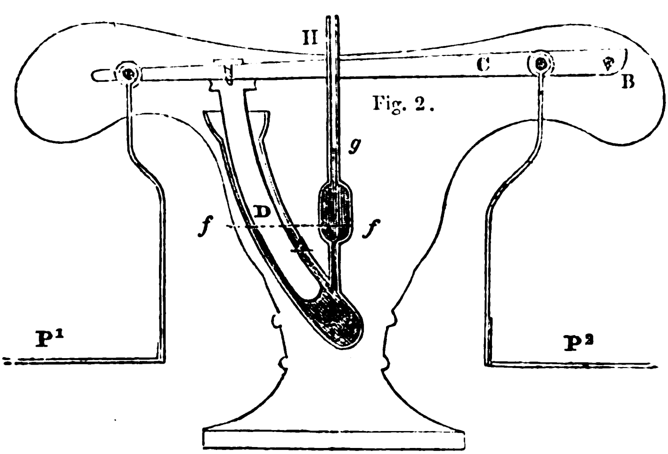


Fig. 2.

BURSILL'S PATENT WEIGHING MACHINES.

In our last number we gave a brief abstract of Mr. Bursill's recently enrolled specification for improvements in weighing and in weighing machines; we are now enabled to lay before our readers a more explicit account, explanatory of this gentleman's very beautiful and philosophical contrivances.

The idea is not wholly new, of indicating weights by the hydrostatic pressure of columns of fluids of unequal densities, as, for example, mercury and water, so that while the column of greatest density shall serve as the immediate determinator of the weights, the other column of least density shall indicate on an enlarged scale to the eye, the minuter variations of the heavier column; but it certainly has not been carried out in practice before, to the same extent as Mr. Bursill has done; a sufficient reason for which may be, that but for several auxiliary contrivances of Mr. Bursill's invention, of great originality and ingenuity, the double column principle as we may call it, could not be turned to any practical account whatever. These contrivances are, first a piston or plunger by the descent or rise of which in the mercurial column, the weight or pressure of the substances weighed is primarily ascertained; second, parallel guide rods to preserve the perpendicularity of the piston or plunger and so diminish friction; third, an apparatus to compensate in all cases for the effects of temperature on the indicator column; fourth, an adjustable index plate (the two last most necessary and valuable appendages to all machines used for weighing aeriform substances, barometers especially); and, fifth, the adoption in some cases of a curvilineal vessel for holding the mercury, whereby a great saving both of space and of mercury is effected.

The engravings on our front page represent a machine in which Mr. Bursill has very happily combined the double column principle and curvilineal form of mercurial holder, with the well known steelyard principle; so that very heavy as well as very light weights may be ascertained by it with equal facility and exactness —by the use too of a comparatively small quantity of mercury, and with a single graduated scale.

Fig. 1 is an external front elevation; fig. 2, an internal section through the partly concealed mechanism. A is a curved cylindrical tube, made of any suitable material, but that which is found to answer best is well-baked pipe clay, to which mercury has less tendency to adhere than any other substance hitherto tried. Near its lower extremity this vessel has an open communication with the small upright glass tube H, which may be either left open to the atmosphere at top, or closed by a stopper; D is a piston moving freely up and down within the vessel A, and attached by a nut and screw on its upper end, to the steel-yard lever C, which is supported by a knife-edged fulcrum at B. The degree of curvature to be given to the mercurial vessel and piston, will of course depend upon the distance at which they are placed from the fulcrum: the curve being that portion of a circle described by a radius from the centre B. Mercury is poured into the vessel A till it rises to the point *f*: from *f* to *g* is filled with some fluid of less specific gravity than mercury—as water, oil, spirit, dilute acid, &c., to which a strong distinguishing colour should be given, as black, red, green, &c.

P^1 P^2 are two scale-pans, suspended from the steel-yard lever C; the one adapted for light, and the other for heavy weights. That for heavy weights P^1, is placed but a short distance from the fulcrum, while that for light weights P^2, is affixed at the farthest end of the lever. The distance between these pans may be so proportioned by calculation, that they shall indicate any definite proportional difference which may be desired; thus, for example, they may be so adjusted in relation to each other, that the one shall indicate pounds and ounces—the other ounces and drachms; while one graduated scale J, acting as an index to the vertical-indicator tube, will serve equally well for both. When the respective positions of the two scale-pans have been determined, weights are to be placed in them alternately, and the results marked down upon the index plate J, J, which is moveable, being raised or lowered by the adjusting nut L.

The zero point (0) of this scale being brought to an exact level with the top of the coloured fluid in the tube H, it will be obvious from these arrangements, that on placing a weight in either scale-pan, the piston D will be depressed, which, displacing a quantity of mercury in the holder A, will cause that in the

tube H to ascend, raising the water or other coloured fluid above it. It will be obvious also that the rise of the coloured fluid in the tube H will be greater than the excess of the vertical rise of the mercury in the vessel A beyond the vertical rise of that in the smaller tube, exactly in the proportion in which the coloured fluid is of less specific gravity than the mercury. When water is employed with mercury, the range will be about twelve times greater in the tube H than in the mercurial vessel A. The application of Mr. Bursill's improvements to the barometer, promises to impart to that valuable instrument a degree of precision of which it has never yet been able to boast; but this branch of the subject we must reserve for some future opportunity.

A REJOINDER TO MR. HOLEBROOK, FURTHER ESTABLISHING THE SUPERIORITY OF SCREW-PROPELLERS OVER PADDLE-WHEELS.

Sir,—Permit me, in the first place, to acknowledge the perfect liberality with which you have opened the columns of your valuable publication for the insertion of every argument relative to *screw-propellers* and *paddle-wheels*, and for the strict impartiality with which you have proceeded during the discussion on this subject. It is a matter of the highest national importance, however inefficiently it may have been handled by Mr. Holebrook or myself; and by affording to the combatants, as you have done, "a clear stage and no favour," the *Mechanics' Magazine* has established its reputation, not only for fair play, but as being the leader in bringing under public consideration the merits of a felicitous adaptation of a discovery made 2,000 years ago by the great mathematician of Syracuse, which will soon produce a change in steam navigation more important than any that has yet appeared.

Mr. Holebrook having had two shots to my one, seems by his concluding paragraph to be desirous of retreating from the contest, without allowing to his adversary the same advantage that he has had himself of shivering a second lance in the combat. To this unknightly proposal I am not disposed to succumb, nor do I believe that you, Mr. Editor, as Marshal of the Lists, would so far outrage the laws of chivalry as to deprive me of the right to try a second tilt in the tourney as well as my opponent. As the inventor of a particular kind of paddle-wheel, it may easily be understood why Mr. Holebrook should endeavour to depreciate the screw; but he can hardly expect that the public will acquiesce in a hypothesis founded upon errors and misstatements, particularly when reference can be made to the results of *experiments*, sufficiently attesting the fallacy of his conclusions.

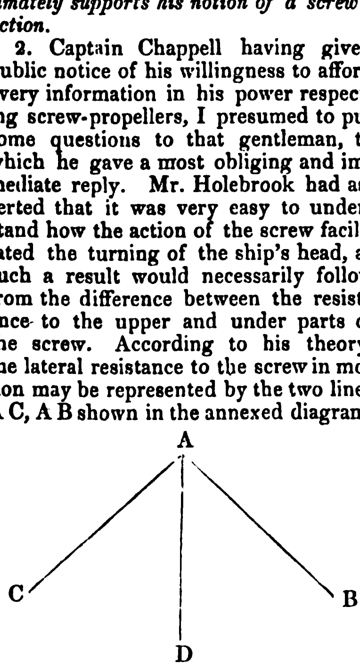
Mr. Holebrook's reply has certainly not strengthened his original position, and the mistakes he has made almost induce me to exclaim, "*natis sepulchro ipse est parens*," for Mr. Holebrook will assuredly be the death of paddle-wheels if he persists in their defence. He reiterates his claim, indeed, to the support of authority and facts, while neither can be adduced in favour of his theory. Authority he has misapplied, and facts are upon the whole against him. First, as to his theory.

1. As a foundation he quotes the deductions of science, in cases when the action of the power is parallel with the *surface* of the plane. In the screw it is parallel with the *base;* and not one of the principles he adduces in support of his conclusions is, as he supposes, in the slightest degree applicable. Any one acquainted with the theory of fluids would have perceived that the admission of my mode of stating the manner in which the resistance arising from inertia operates, was at once a confession of the erroneousness of Mr. Holebrook's calculations, so far as *theory* extends. It must be clear to any one who rightly considers the nature of a screw's action, that it is scarcely possible to imagine a mechanical means of propulsion possessing greater advantages. There is theoretically *no* loss of power from indirect action, as in the paddle-wheel; the screw affords the greatest surface in the smallest space; there is a positive gain of power in the screw itself; and it is possible to give to it almost any amount of additional speed. To these should be added the important advantages of position, security from shot, continuous action, uninterrupted by different degrees of displacement, as the ship may chance to be heavily or lightly laden, or as she may happen to pitch or roll in the waves.

I repeat, Sir, that Mr. Holebrook is altogether wrong in supposing that any

of the recorded laws of mechanical and hydrostatical science can be correctly applied, as he has applied them, to elucidate the action of the screw. For my own part, I went upon one simple fact, to which I made what is known of the laws of fluids subservient; and I never supposed that the results I gave as the theory of the screw's action would be fully borne out in practice; but I maintain, that so far as theory, with respect to fluids, can be sustained by facts, so far what I stated has been proved to be correct. *I defy Mr. Holebrook to produce one authority, or one fact, that legitimately supports his notion of a screw's action.*

2. Captain Chappell having given public notice of his willingness to afford every information in his power respecting screw-propellers, I presumed to put some questions to that gentleman, to which he gave a most obliging and immediate reply. Mr. Holebrook had asserted that it was very easy to understand how the action of the screw facilitated the turning of the ship's head, as such a result would necessarily follow from the difference between the resistance to the upper and under parts of the screw. According to his theory, the lateral resistance to the screw in motion may be represented by the two lines A C, A B shown in the annexed diagram,



A D being the axis of the screw; and whichever is taken to be the resistance to the under parts, the vessel's head will be inclined to that side by the action of the screw, the helm meanwhile being kept amidships. I therefore asked Capt. Chappell the following question:—

"When the ship has not gathered head-way, does the rotation of the screw alter the position of the ship's head, supposing the helm to be kept amidships?"

Captain Chappell replied—

"The rotation of the screw has *no effect whatever* upon the ship's head, unless the helm be inclined to port or starboard."

This, Mr. Editor, is precisely what I should have concluded from the peculiar action of the screw, "*according to the recorded laws of mechanical and hydrostatical science,*" though it is in direct contradiction to Mr. Holebrook's hypothesis. He has imagined that I mistook what he asserted on this subject; I can assure him that I did not, but I saw he was labouring under a delusion, and I endeavoured to set him right. In a note to the above question I said, "I take it for granted that Captain Chappell meant that the screw acted on the rudder when it was inclined one way or the other for casting." He replied—"You are quite right in this supposition." It was not, however, Mr. Holebrook's fault, perhaps, that he misunderstood Captain Chappell's observation, relative to the effect of the screw upon the rudder, since the error of Mr. Holebrook may have arisen from the misfortune of his having undertaken the discussion of a matter he was wholly unacquainted with.

Mr. Holebrook has further endeavoured to account for the lateral action he supposes to exist not being felt when the ship was under way; but it is manifest, that did it exist it must be felt, for the underneath lateral resistance will always be capable of a resolution into a constant force represented by the line A C or A B, and always exceed the contrary constant force of the upper lateral resistance; wherefore I asked Captain Chappell,

"When the ship has gathered headway, does the action of the screw constantly tend to force the vessel's head out of a straight course, in one particular direction, when going forward, and the contrary when going astern?"

He replied—

"If the screw revolves one way, it gives the ship headway; if the contrary way, it gives her sternway; but let the screw revolve which way it will, no alteration of the ship's head is effected but by inclining the rudder to port or starboard. When the screw is going, its action on both sides of the rudder is so equable that it keeps the ship's head as it were *nailed* to one direction, so long as the helm is kept amidships."

This is plainly confirmatory of my statement; and what Mr. Holebrook

says about bearing, seems to me the very thing that occurs: the rudder constantly recedes from the rush of water, and the screw as constantly keeps up the stream in full force, thus turning the ship's stern, and consequently her head, as if revolving on a pivot.

With regard to Mr. Holebrook's two irresistible suppositions, I have only to observe that I was not stating the actual practical results; but endeavouring to arrive at a proximate theoretical explication of so novel an application of mechanical power: and those two suppositions do not in the least affect the truth of my theory. I may here add, that it has come to my knowledge from unquestionable authority, that Mr. Brunel, in a very able report upon this subject, made to the Great Western Steam Ship Company, has conclusively established the superior propulsive qualities of the screw, upon data furnished by various experiments made under his own superintendence on board the *Archimedes*, as well as on board the *Great Western* steam ship; so that the incorrectness of Mr. Holebrook's views is proved, and the principle of screw propulsion found to be strictly consonant to science and fact, upon the testimony and judgment of an eminent engineer, who is wholly disinterested in the question at issue relative to the comparative merits of screw propellers and paddle wheels.

Mr. Holebrook has further endeavoured to prove, that the steam-engines of the *Archimedes* were of greater power than is represented. Upon this point also I made inquiry, and find that the aggregate power of the engines was determined upon two or three occasions by the application of an indicator; and as to Mr. Claxton having mistaken the diameter of the paddle-wheels, I believe him to have been quite correct in his calculation; and I much doubt if the *Archimedes* steam machinery would drive paddle-wheels of that diameter at the rate of 25 revolutions per minute, much less if those wheels had been of a diameter sufficient to enable the vessel to attain her present average speed. Upon referring to Captain Chappell's clever pamphlet, I find that in the Caledonian Canal, when there was smooth water and no tide, the *Archimedes* averaged *nine* knots an hour, which gives a slip of very little more than one-sixth, showing a result similar to what Mr. Brunel is said to have attained by another method—so that it is evident Mr. Holebrook, however ingeniously he may attempt to excuse his error, had, as I asserted, fallen into great confusion upon this part of the subject. The *slip*, as I should define it, is the difference between the speed gone, and the speed *possible to be gone*, such, that the screw, instead of passing rectilineally the length of its axis at each turn, passes some less distance, varying according to the rectilineal velocity imparted to the body to which it is affixed; and arising from the imperfect resistance offered by the medium in which it acts. Upon what principle, however one is to assume a slip of 14 miles, more than there is any possibility of the ship's going, I really am unable to comprehend.

I freely acknowledge that some of Mr. Holebrook's perpendiculars would impinge upon the rudder, though few and far between, and greatly impeded by the interposition of the stern post; but I cannot imagine any such violent action as is said to be observable, though fact is again rather more in my favour than against me.

As to the angle 48°. 20′ I must have looked out by mistake the log. tan. 9.994, &c., instead of 9.94, &c., which makes the difference. However this might very well be stated as 45° in round numbers: and I still maintain that the angle only matters *in theory*, as it affects the length of axis necessary to ensure a certain speed in a certain number of revolutions. Experience will decide this!

With regard to the success of the screw, Mr. Holebrook may rest assured that both the Admiralty and the Great Western Steam Ship Company have openly avowed its adoption; and several vessels upon this principle are constructing in different quarters by private individuals. A company has been formed at Bremen for building two steam screw ships to run between the Weser and New York! and another association is engaged in introducing the screw upon the canals and rivers of Belgium and Holland, so that there is every probability of our controversy being soon set at rest by experience.

Mr. Holebrook has made some comment upon the *Archimedes* being laid up *unsold* in the East India Docks. Will he inform us why hundreds of other fast steamers are in the same situation, including, unless I am much misinform-

ed, the flying *Eclipse* lately constructed by Mr. David Napier? May not the season of year account for this inaction, rather than any want of merit in any of those vessels?

In conclusion, I may remark, that though it might be satisfactory to Mr. Holebrook to leave the public under an impression that he had not fallen into the blunders he has committed, yet truth and fair play have compelled me to expose them. At the suggestion of that gentleman, I shall now quit the field, to return to it again, however, should any further attempt be made by Mr. Holebrook to call in question *the manifest superiority of screw propellers over paddle wheels!*

I am, Sir, with great respect,
Your most obedient srvant,
ROGER PHILLIPS.

Whitehaven.

ON THE PHENOMENA OF MOTION.

Sir,—Your very laudably inquisitive and persevering correspondent Mr. G. A. Wigney, is entitled to particular notice. I say the same of E. A. M.; from both agitating questions and combating opinions with the desire of arriving at truth, and after a manner for the public, and not indvidual benefit alone.

Every phenomenon in the manufactory, and in the laboratory, is performed by the powers of nature, equally as every planetary phenomenon. Hence the philosophy or procedure of nature is common to the whole. Nature's procedure not being understood, all description on our part must be mere guess work; and stands self-proved as such in the want of unity of opinion between man and man, or say, between all philosophers.

The present-day-philosophy does not warrant the natural fact, in any one instance whatever, being arrived at by either observation or experiment, or both; because it does not set forth, that observation does *not* extend beyond the sensations promoted by externals and which, but seemingly, are qualities of their outward causes; and because, experiments are never accounted for on the *only* fundamental principle on which a system of physical philosophy can with consistency be possibly founded—INERTIA, the inertia of atomic matter universally; therefore of bodies universally. On the contrary, we adopt inertia as a physical cause, and imitatively fall into the blunder, the *vis* INERTIÆ of matter, that is, the force of inability—the power of impotency—and this on the highest authority in science!

E. A. M. asks, in a short question, that which eighteen hundred years have not answered; she only asks, "why a billiard ball runs away when it is hit?" I answer; it is pressed away or forward. She adds, "on this pivot the most interesting experiments, at present in hand, may be said to hang." Aristotle says, "he who does not understand motion is ignorant of all things." And why? but because the like of our sense-excited-perceptions do not belong to matter or bodies—because in knowing only these we know nothing of bodies—and because no effect can by possibility be produced on inert matter but of a local nature or change of place, which is motion; for which pressure in the whole of nature, is the only analogous cause. The province of philosophy is to make known the cause of motion; and "the whole of true philosophy, the philosophy of nature, consists in the science of cause."

The functions of our senses teach, that light, colour, heat, cold, sound, flavour, and odour, from being sensations, yet seeming to belong to bodies, are not material agents. Inertia teaches, that matter has no self-acting assented properties, what then can be referred to as cause but the general pressure, under which all things exist and without which there would be no bodily formation, no decomposition and intermixture, no growth, no life, no planetary motion. Hence, instead of "a few experiments depending," there is not, nor ever has been, a single phenomenon understood or but falsely illustrated, nor ever will, without the knowledge of motion."

I beg to refer the reader to Messrs. Whittaker, the booksellers, who have, and now own, my work on the subject, which answers the question: What is the cause of continuous motion? My work cannot be understood by piecemeal, only by its being *studied rudimentally*.

T. H. PASLEY.

November 6, 1840.

LATENT HEAT—CIRCULATION OF THE BLOOD—REPLY TO MR. WIGNEY.

Sir,—In reply to Mr. Wigney's remarks in your No. 893, where he so

gallantly sounds the tocsin to discussion, I must assure him, I feel no hesitation whatever in responding to his call, and rendering whatever aid I can in answer to his interrogatories; but I may perhaps be allowed to observe, that very little utility can be expected to arise from hypothetical observations on natural phenomena, however plausible they may appear, unless accompanied with ready reference and applicability to ascertained facts and experimental proofs. The value of philosophical argument must consist in an intelligent concentration of reasoning and results; and subjects argued by conflicting opinions founded in a mere play upon words, like the collision of flint and steel, may throw out some sparks to dazzle the eye, but give no tangible result, and leave impressions on the minds of the general reader, perhaps more calculated to puzzle than instruct.

The question Mr. Wigney raises, namely —whether a perfect vacuum so called, created within the receiver of an air pump, would not be occupied by the presence of caloric? may undoubtedly be answered in the affirmative, so far as its presence is indicated by its effects, in accordance with that diffusive power, by which, though conducted by some classes of bodies with more facility than others it is permeable to all; but I agree not with Mr. Wigney's further conclusion, that it there becomes latent, that is, insensible or inactive heat. It is proved to exist under the condition of free or positive caloric, by placing a thermometer cooled below the temperature of the surrounding atmosphere, in the interior of the exhausted receiver, when it will be found quickly to rise to the same point, and be subject to the same fluctuations as take place in the external air.

Probably this imponderable fluid caloric, known to us by its peculiar features so distinct from the usual properties of matter, may be that subtle ether, which there is reason to believe occupies the vast extent of universal space and is the cause of the obstruction which the comets appear to meet with in their rapid course, as shown by their luminous atmosphere being trailed behind in the form of a tail. On this supposition caloric will be common to all planets and systems, and consequently, in connexion with the earth, will not require to gravitate as do other forms of matter to preserve its equilibrium. This would fully account for the perfect absence of weight that distinguishes it, and forms so forcible an argument for its immateriality.

Mr. T. H. Pasley in the same number of your Magazine, attempts to set the question at rest by a mystification of cause and effect that contains within itself a sufficient contradiction. Modestly condemning the popular error, that heat expands the thermometric fluid, we are thereby enforced to disbelieve the evidence of our senses! We are informed that "substance" is the cause of its increase of volume, when the tube being hermetically sealed no substance can obtain admittance. And then we have another version of the subject, arguing that physical force expands the said column of mercury when none can possibly be exerted without fracturing the glass tube. It is also propounded that heat and its effects are only known to us through the medium of the nerves of the feeling sense—situate and supposed at the fingers ends; and when the fingers ends shall happen to get burnt, it is not the fire we feel, but a sensation with which we have unfortunately become acquainted!

In answer to Mr. Wigney's queries on the subject of the flow of the blood, I have no theory of my own to propose, or anything calculated to throw new light on the subject, as the researches and conclusions of anatomists appear very satisfactory—so far as their observations and experiments have extended. It is argued that the valves of the heart exert their projectile force in propelling the blood through the vascular system independently of any source of motion contained within the blood itself, but that this action is kept in constant play by a quickening stimulus exerted by the blood upon the interior surface of the heart in contact with it. This application of stimulus is kept constantly maintained by the high temperature resulting from chemical action with atmospheric air in the process of breathing.

To the same condition of vital sensibility and activity, constantly supported by the stimulating influence of the blood which maintains the muscular system in its power of creating physical motion at the will of the person, may be attributed the action of the heart with the distinction that it is kept in unceasing play by a motive power peculiar to itself. If it

be admitted that the principle of life, which gives to man command at will over the nervous and muscular system of the body, may also support the muscular action of the heart without intermission—and I see no reason to doubt it—then is it shown by its structure, as I endeavoured to point out in a former communication, to be well adapted to the purpose of propelling the blood through the human frame; there appearing no ground for attributing inherent activity to the blood, when so perfect a means of accounting for its motion is exhibited in the valvular action of the heart itself—this action being kept in constant repetition by the continued application of the stimulating influence itself.

The arteries themselves are proved by experiment to be possessed of a vital power of contraction, by which they assist in keeping the circulation constant and equable. In the smaller arteries, where considerable obstruction would be met with from friction, a compensating power exists, by which the flow of the blood, instead of being retarded, is aided in its course.

At every injection of blood into the arteries by the action of the heart, their elastic structure becomes expanded to a certain tension by the force of the current, and it is their contraction again at the intermediate periods, with a greater amount of force or pressure than was expended in their distension, which adds to the momentum of their contents, and tends to overcome the resistance which is met with in their passage through the intricate net-work of the smaller vessels.

Mr. Wigney inquires if the arteries are destitute of air-vessels, serving the same purpose as the pipes in his refrigerator? A kind of exterior tube I presume is meant, encircling them for the conveyance of a current of refrigerating fluid, or any adaptation of structure likely to assist in his analogy; but no such peculiarity of construction has been yet observed by physiologists; the three distinct coats of which each arterial tube is composed, existing in close and immediate contact with each other. Unluckily for Mr. Wigney's inference that the primary cause of circulation of the blood is due to the impartation of heat to it in its passage through the lungs—the effect is just contrary to that which is demanded by the laws of hydrostatics. When the lower portion of any fluid receives an increase of temperature, it is thereby rendered of lighter specific gravity and rises to the surface, while the remaining portion of the liquid that has received no impartation of heat, descends to take its place and restore the equilibrium. If the supply of heat is maintained, this effect will be continuous and a constant circulation of the fluid be the result. It is at once perceived that the course which is pursued by the blood is just the reverse of this, on receiving its supply of heat the arterial fluid courses downward at a very rapid rate, from the heart to the extremities, and gradually decreases in temperature as it ascends through the veins during the period of its return to the lungs. Leaving the subject to Mr. Wigney's further cogitation,

I remain, Sir,

Your obedient servant,

A. Y.

Brighton, Oct. 3, 1840.

RHODIUM *v.* EVERLASTING PENS.

Sir,—Your correspondent "Plume," in your last Number, is in error, when adverting to what he terms Mr. Hawkins's *rhodium* pens.

Dr. Wollaston, the discoverer of rhodium in 1803, applied nibs formed of that metal to a pen, its extreme hardness and toughness seeming to afford promise of great durability. The result justified his expectations, and a few similar pens were made for sale.

The rhodium pens of the present day, however, are altogether guiltless of the presence of any of that scarce and valuable metal; they are now formed of an alloy of platinum mostly with tin, but this alloy unfortunately becomes brittle and fragile in proportion to its hardness; the *toughness* of the rhodium is always wanting.

Ruby pens, i.e. ruby nibs set in fine gold, form a very durable pen, but Mr. Hawkins professes to have discovered a natural metallic alloy* much harder, and therefore more lasting than any of the foregoing.

Tolerably convincing proofs are given of the durability of the nibs of these pens, which Mr. Hawkins significantly designates "everlasting;" and it is only to be regretted that their costliness for-

* Rhodium is found in combination with platinum and palladium.

bids their use to most of those "who have much writing to do."

I am, Sir,

Yours respectfully,

Wm. Baddeley.

December 7th, 1840.

HAWKINS'S EVERLASTING PEN.

Sir,—Your correspondent "Plume," in the last Number of your valuable Magazine, page 519, has sadly degraded my pen by calling it *a Rhodium Pen*.

It is well known that the continued use of a rhodium pen will so wear away the nibs in about six months, as to render it unfit for good writing; while the nibs of my pen exhibit no appearance of wearing by six years of constant use. I therefore have advisedly and confidently assumed the term Everlasting Pen, in the full persuasion that the natural alloy of which the nibs are made will endure daily use for ages, and that the pens will become heirlooms in families.

My experience of their excessive hardness and durability leads to the conclusion that some seventh descendant of a great author of the present day may, 200 years hence, in a letter to a friend, say, "I address you by means of the pen with which my great grandfather's great great grandfather wrote the whole of his voluminous works, and which pen has been actively employed by all my ancestors since his time, and is still a good pen."

I am, Sir,

Your most obedient servant,

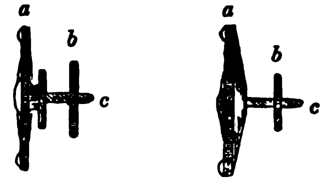
John Isaac Hawkins.

Quality-court, Chancery-lane, Dec. 8, 1840.

BACHELOR'S BUTTONS—SELF-ACTING CANDLE EXTINGUISHER.

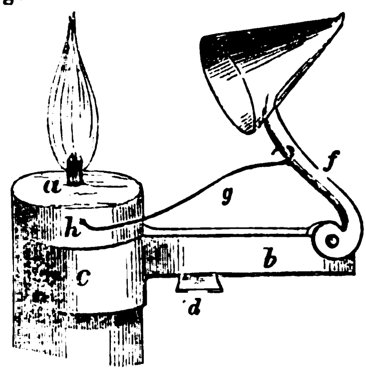
Sir,—Mr. Baddeley's account of the bachelor's button in the *Mechanics' Magazine*, part 212, as well as the Frenchman's statement of his supposed novelty in the daily papers, has induced me to send you two buttons with screw shanks and nuts, manufactured 12 years since by Messrs. Edward Woodcock and Son, working jewellers, London.

If worthy a place in your valuable journal will you oblige your numerous readers with a sketch of them? [They are represented in these two engravings:



a being the front of the button; *b* a screwed shank, and *c* the nut by which they are attached to the garment. In the one instance the button stands out from the apparel by means of a shoulder —in the other case by the inclined position of its back only. Ed. M.M.]

I also transmit you a rough sketch of a self-acting extinguisher invented by the same persons upwards of 14 years ago.



a, Candle.

b, A steel spring clasping the candle firmly with its jaws.

c, Jaws of the spring.

d, A wing on each side of the spring to facilitate the removal of the apparatus from the candle.

e, Joint.

f, Arm of the extinguisher.

g, A small pin of No. 20 wire loosely fastened to the arm *f*.

h, The sharp point of the wire is pushed into the candle at a short distance from the wick as soon as the tallow is melted, the wire lowers its support, and the weight of the extinguisher carries it forward on the wick and the light is put out.

I am, Sir,

Your most obedient servant,

P. C. Williams.

November 30, 1840.

HOWARD'S SYSTEM OF CONDENSATION—REPLY TO MR. SYMINGTON.

Sir,—I shall not follow Mr. Symington's example of personal recrimination; his remarks in your last number, with regard to *myself*, may pass for what they are worth—or even he may deem them worth—except only one, namely, that I made on a former occasion, "a public apology to him for a hasty assertion." I did no such thing, and he is not entitled to put this construction on a courteous mode of expression or explanation on my part. But never mind; in matters of this kind I am of the poet's opinion—

" Where there's no honour to be gained,
'Tis credit lost in being maintained."

Truth, Mr. Editor, is said to live in a well; and if by throwing in a pebble I should cause our friend to show his honest face above ground, even for a short time, for he is very shy, I shall be satisfied, and the cause of truth and the progress of science—for *this* is the subject at issue—will be benefitted; and I am happy to note that your journal, being open to all parties and of great circulation, now aids the good cause not a little.

I asserted that in the manner set forth a saving of a fourth of the fuel could not be made in the *Dragon*. I again assert this, unless indeed it be accompanied with a corresponding *saving of speed*, and the *Dragon*, I admit, is entitled to the palm of economy in the latter respect. What! by an *alternate* use of the plan for two hours for a-day? A moment's consideration must convince any man having the least knowledge of the subject, that under *such circumstances* the saving of fuel cannot even be appreciated.

But Mr. Symington goes further than this, and states most unequivocally that a saving of *one-third* of the fuel was effected in the *City of Londonderry*. Now, Sir, what is the *truth* with respect to this vessel. On applying to the Peninsular Company, as I before stated, on the infringement of my patent, I communicated with one of the leading Directors, a gentleman whose character is above suspicion, and well versed in matters relating to steam navigation, and he informed me, in the presence of a friend who happened to be with me, that the exterior pipe of Mr. Symington, when used *alone*, reduced the speed of the engines to *twelve* strokes per minute, or about one-half—that he was of opinion that it retarded the vessel's way nearly a mile an hour from its position—and, further, that Mr. Symington proposed to divide the large pipe into many smaller ones, if the Company proceeded with the work (being a still closer approximation to the practical carrying out of my invention), but which he assured me should not, under the circumstances, be permitted. He further and fairly stated, that the application gave indications of advantage, so far as could be ascertained by such imperfect means. As to the saving of fuel—the *effect* being regarded—but your readers may judge for themselves on this point. One-third, Mr. Symington! Oh, fie! I say again, that a perfectly efficient application of the method as practised by myself (I speak advisedly, as will appear in due time), *now and long before* Mr. Symington's patent, or rather *specification*, cannot produce this effect; and, I repeat it, I should be ashamed to practise such deception; and, moreover, I will not suffer others to do it unreproved.

Deferring my promised exposition of the method of condensation by reinjection for a short time,

I am, Sir,
Your most obedient servant,
THOMAS HOWARD.
King and Queen Iron Works, Rotherhithe,
7th December, 1840.

MR. PEARCE'S CONCENTRIC VALVE.

Sir,—Having just come to town and read your number of the *Mechanics' Magazine* for October, I beg leave to remark, that it seems to me that Mr. Pearce's concentric valve for steam engines is but a modification of one formerly invented by a Mr. Murray, and liable to the same objection, viz.—the very great waste of steam, from the great length of the steam passages. It seems also that the friction for working it would be just as great, at least very nearly so, there would be also much more trouble in the adaptation of it.

Your obedient servant,
C. E. BAGOT, M.D.
12, Charlemont Place, Dublin.

SAFETY LOCK.

Sir,—The frequent accounts in the public journals of domestic robberies have induced the following idea of a kind of preventive. It consists in placing the lock so as to face the hinges, and the key-hole at the back of the jewel or other box.

To iron safes, in a stone or brick-work recess, and turning on a pivot, this plan might be advantageous. The lock may not be the best possible, but safe, from being out of reach of the picklock. In case of fire the wall will not ignite the safe, which might be padlock-secured, with the *same key*, and have the key-hole within the wall at night. T. H. P.

November 6th, 1840.

PROOF OF PROPOSITION XXIX, BOOK I OF EUCLID, INDEPENDENTLY OF AXIOM XII.

Sir,—The attempt to discover a simple proof of the 29th Proposition of the First Book of Euclid, without the assistance of the Twelfth Axiom, seems to be as favourite, though I hope not as futile, a pursuit in mathematics, as perpetual motion is in mechanics.

Kinclaven has very properly shown, that the assumption, drawn by Mr. Sankey from his otherwise clever demonstration at page 560 of your last volume, is quite unwarrantable: and still more inadmissible is Mr. Sankey's mode of forming an equilateral hexagon as described on the succeeding page; it is, in fact, a complete begging of the question: Mr. S. has neither described how the middle triangle is to be constructed; nor proved that, when constructed, it is equal to the others. I beg to hand you, for insertion in the *Mechanics' Magazine*, a simple proposition in nowise differing from the spirit of the First Book of Euclid. From it, the proof of the 29th Proposition will follow in the most direct manner. I shall leave it open to criticism for one month, when, if it be not proved inadmissible or inconsistent with the spirit of the First Book, I shall follow it up by another proposition still more simple, to which the proof of the 29th Proposition shall be a corollary.

I am, Sir, your obedient servant,

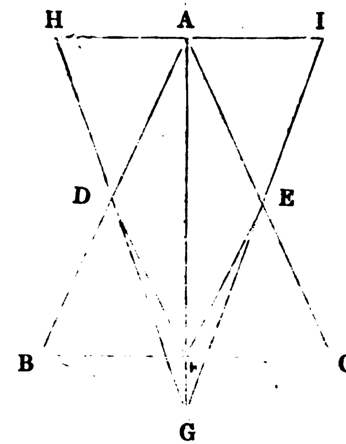
NAUTILUS.

Prop. A. Theor.

If the base and the sides of an isosceles triangle be bisected; and if straight lines be drawn from the points of bisection in the sides, to the point of bisection in the base; the two triangles so formed upon the base are also isosceles.

Let A B C be an isosceles triangle, bisected in the sides and base at the points D E F; join D F, E F. The triangles B D F, C E F, are isosceles.

For, if the triangle B D F, be not isosceles, let the side D B be longer than D F. Join A F, and because A F is drawn from the vertex of an isosceles triangle and bisects its base, it is perpendicular to the base, and also bisects the vertex angle B A C (9th and 11th of 1st). In A F produced, take a point G, so that D G shall equal D B; join D G, E G, B G; then, since G A, A D, are equal to G A, A E; and the angles at the vertex equal by bisection; the bases D G, E G, are also equal, and the angle D G E is bisected by A G (4th of 1st). Produce G D, G E; and make D H, E I, each equal to D B: join H I, and because H I is the base of the isosceles triangle H G I, of which G A bisects the angle at the vertex, therefore, G A is perpendicular to H I (12th of 1st.)



Because D H, D A, D B, D G, are equal, and the vertical angles at D, also equal (15th); therefore, the base H A, is equal to the base B G (4th).

But, because, in the triangle B F G, the angle B F G is a right angle, and therefore, the angle B G F (equal to B G A) less than a right angle (17th).

Therefore, in the two triangles B G A, H A G, having the sides B G, G A; equal to the sides H A, A G; but the contained angle H A G, which is a right angle, greater than the contained angle B G A, which is less than a right angle; the third side H G is greater than the third side B A (24th); take away the equals H D, A D, and there remains D G greater than D B.

Therefore, D G is not equal to D B; neither can it be equal to it, so long as the triangle B F G exists; and since the triangle B F G must exist if the point G be taken any where in A G, but in the point F; therefore, D G must be equal to D F, and, consequently, D F is equal to D B, and the triangle B D F is isosceles.

But the triangle F E C has equal sides and base with the triangle F D B, therefore it also is isosceles (8th).

Wherefore if the sides, &c.

Q. E. D.

Cor. A straight line drawn across an isosceles triangle through the points that bisect its equal sides, is at right angles with the perpendicular to the base, and also bisects it.

A PARTING WORD FROM "SCALPEL," ON MR. HALL'S CONDENSATION.

Sir,—Had "Honestometer" contented himself with wrong deductions from premises, I should have "left him alone in his glory." But he has boldly asserted, that "'Scalpel' has indulged in gross personalities towards Mr. Hall from the commencement of his correspondence with you." Will "Honestometer" permit me to inform him, with all imaginable politeness, that the first essential for a writer is truth; that he ought to "nothing extenuate nor set down aught in malice," and never to let his zeal or imagination supply his facts. Why he, also, should follow the dangerous path of his predecessors to commence personal attacks upon poor me, instead of confining himself to the subject matter, it might not be difficult to determine. Excepting my first paper there is no approach even to one gross personality towards Mr. Hall, but just the contrary. In that paper an observation in reference to his dispute with Mr. Holebrook, and which one of your correspondents has termed mere harmless jocularity, is the sum of my offence. As to others, the lesson may serve to introduce a more wholesome state of discussion, since I attacked none who did not throw the first stone. In this respect, as also in other parts of "Honestometer's" last, he has lain himself open to much severity of reply, but I shall follow the directions of old Isaak Walton how to skewer and serve up a frog—"treat him gently, as though you loved him." A few observations will suffice.

To go over the same ground again to satisfy "Honestometer" of "his terrible mistake," would be a waste of time, and an impertinent occupation of your columns, of which this discussion has already had more than its share. That only master of the pickaxe style of composition, Will. Cobbett, observes, with the interesting modesty for which he was so distinguished—"When I am asked what books a young man or young woman ought to read, I *always* answer, let him or her read *all the books that I have written*," (only 100 vols.), adding, that it was his "*duty*" to give this recommendation. Now, I don't ask "Honestometer" to read *all* my papers—for that would be too severe an infliction—but it is my *duty* to refer him to those which have before so fully treated on the subject. He will find his error in the ten top lines of his paper, p. 333, No. 894, which, with all his "*masculine* knowledge of science," he could never have made, had he sufficiently understood the principles of the steam engine to write about them, or attentively considered this discussion. He safely asks me who are the scientific men who *now* admit the fallacy of Mr. Hall's system? He did not expect me to betray the conventional confidence of society, and make public their names, and thus he would snatch a triumph from my silence. But does he not perceive, that to disprove my statement he must take his evidence from the present to which my *now* applies, and not as he has done from the past. This is neither argument, "Honestometer," nor refutation. You should have told us who has ordered these condensers since their merits were investigated by "Scalpel?" not who used them before. But probably you had in view that Horatian precept, "Omnia vult belle Matho dicere—dic aliquando et bene, *dic neutrum*, DIC ALIQUANDO MALE."

Had Mr. Hall's advocates been satisfied with claiming for his system only those advantages which I have fully admitted it does possess, this discussion could not have arisen. But those only who have been accustomed to weigh conflicting testimonies of a past time, and to draw truths from a mass of rubbish, can sufficiently estimate the injury of allowing errors of science to be received as truths, particularly as if apparently established by experiments. It is the sure barrier against all future improvement. The great increase of power insisted upon, and inferred from the numerous certificates of managable engineers, who had too easily been led to give them without sufficient examination, is "the fallacy" I have shewn, and which *is now* admitted.

This discussion brings to mind two eras of my reading which so appropriately well illustrate all such desultory treatment of a subject, that in finally withdrawing from further part in it, I beg excuse for introducing them. One I consider the foundation of all sound learning, the other a guide for successful controversy. Had they been acted upon, one half the books had never been written, and this matter had terminated with my second paper.

Magliabechi was a cormorant by the tree of knowledge: he passed all his life among his books, and knew nearly every thing. A living library, he died at eighty, but so little was he capable of digesting what he had read that he could not make use of it, and all he

produced from his immense stores was this memorable observation, "It is not sufficient to become learned to have read much, if we read without reflection."

The other instance is still more remarkable, as a warning to those who, however great their natural parts, rush into a controversy without a complete knowledge of their subject. That extraordinary genius, Hobbes, began mathematics at too late a period of his life (40) to make him equal in that science to another of very inferior ability, who had commenced at the proper age, and was a mere mathematician, and he got himself involved in a twenty years paper war with Dr. Wallis. He maintained a noble struggle, the true fire of genius blazing forth like a troubled volcano, but it was quenched by the cold unconsumable snows of mathematics. Nearly maddened, he was obliged at last to give in, and broke out with an exclamation which, not inappropriately perhaps, may be applied to the past discussion: "I alone am mad, or they are all out of their senses: so that no third opinion can be taken unless any will say that we are all mad."

I am, Sir,

Your obedient servant,

SCALPEL.

December 7, 1840.

ON THE CORROSION OF CAST AND WROUGHT IRON IN WATER. BY ROBERT MALLET, ESQ. ABSTRACT OF A PAPER COMMUNICATED TO THE INSTITUTION OF CIVIL ENGINEERS.

[This communication is one of those forwarded to the Institution in consequence of the Council having considered this subject a suitable one to compete for the Telford Premiums; and the author having been long engaged in making experiments on this subject at the request of the British Association, refers in the introductory part of this paper to the contents of that report, which may be viewed as a "*précis*" of the state of our knowledge on the subject to the year 1839, together with original researches forming the basis of the present results. This communication is accompanied by a most elaborate set of tables of results.]

From Mr. Mallet's experiments, it appears, that the metallic destruction or corrosion of the iron is a maximum in clear sea water of the temperature of 115° F.—that it is nearly as great in foul sea water —and a minimum in clear fresh river water. Iron under certain circumstances is subject to a peculiar increase of corrosive action—as, for instance, cast-iron piling at the mouth of tidal rivers—from the following cause. The salt water being of greater density than the fresh, forms at certain times of tide an under current, while the upper or surface water is fresh; these two strata of different constitution coming in contact with the metal, a voltaic pile of one solid and two fluid elements is formed; one portion of the metal will be in a positive state of electrical action with respect to the other, and the corrosive action on the former portion is augmented. The lower end of an iron pile, for instance, under the circumstances just mentioned, will be positive with respect to the other, and the corrosion of the lower part will be augmented by the negative state of the upper portion, while the upper will be *itself* preserved in the same proportion. From this theoretical view may be deduced the important practical conclusion, that the lower parts of all castings subject to this increased action should have increased scantling. The increased corrosive action of *foul sea* water may be referred to the quantity of hydrosulphuric acid disengaged from putrifying animal matter in the mud, converting the hydrated oxides and carbonate of iron into various sulphurets, which again are rapidly oxidized further under certain conditions, and becoming *sulphates* are washed away. Hence the rapid decay of iron in the sewerage of large cities, and of the bolts of marine engines exposed to the bilge water. The corrosive action being least in fresh water may be partly referred to this being a worse voltaic conducting fluid than salt water. It appears also that wrought iron suffers the greatest loss by corrosion in hot sea water; which fact has led the author to inquiries, with reference to marine boilers, at what point of concentration of the salt water, whether when most dilute, after the common salt has begun to deposit, or at a farther stage of concentration, the corrosive action on wrought iron is the greatest, and he points out the important practical use which can be made of this information. It appears also, that the removal of the exterior *skin* of a casting greatly increases the corrosive action of salt water and its combined air, so that the index of corrosion under these circumstances is not much less than that of wrought iron, and in clear river water is greater. It farther appears, that chilled cast iron corrodes faster than the same sort of cast iron cast in green sand, and that the size, scantling, and perhaps form of a casting, are elements in the rate of its corrosion in water. The explanation of these facts is to be found in the want of homogeneity of substance. and the consequent formation of numerous voltaic couples, by whose action the corrosion is promoted. It is also observable that the corroded surface of all these chilled specimens is tubular. It appears also that, in castings of equal weight, those of massive scantling have proportionately greater dura-

bility than those of attenuated ribs and feathers. Hence appears also the great advantage of having all castings, particularly those intended to be submerged, *cooled in the sand*, so as to insure the greatest possible uniformity of texture. The principles now stated afford an explanation of the fact often observed, that the back ribs of cast iron sheet piling decay much faster than the faces of the piles. It is also probable that castings in dry sand and loam will, for these reasons, be more durable than those cast in green sand. The general result of all these experiments gives a preference to the Welsh cast iron for aquatic purposes, and to those which possess closeness of grain. Generally, the more homogeneous, the denser and closer grained, and the less graphytic, the smaller is the index of corrosion for any given specimen or make of cast iron. The author next proceeds to the important question of the protection afforded by paints and varnishes. White lead perishes at once in foul water, both fresh and salt; and caoutchouc dissolved in petroleum appears the most durable in hot water, and asphaltum varnish or boiled coal tar laid on while the iron is hot under all circumstances. The zinc paint, which is now so much noticed as an article of commerce, the author has analyzed, and states its composition as

Sulphuret lead	9.05
Oxide zinc	4.15
Metallic zinc	81.71
Sesqui-oxide iron	0.14
Silica	1.81
Carbon	1.20
Loss	1.94
	100.

It may, *à priori*, be considered likely to produce a most excellent body for a sound and durable paint under water. The black oxide of manganese has no advantages but that of being a powerful drier. The defects of all oil paints arise from the instability of their bases; the acids which enter into the constitution of all fixed oils readily quit their weakly positive organic bases to form salts with the oxides of the metal on which they may be laid. Hence we must look for improvements in our paints to those substances among the organic groups which have greater stability than the fat or fixed oils, and which, in the place of being acid or Haloid, are basic or neutral. The heavy oily matter obtained from the distillation of resin, called "resenien," and eupion, obtained from rapeseed oil, have valuable properties as the bases of paints. Accompanying tables contain the results as to the corrosion of cast iron in sea water when exposed in voltaic contact with various alloys of copper and zinc, copper and tin, or either of these metals separately, per square inch of surface. It appears that neither brass nor gun-metal has any electro-chemical protective power over iron in water, but on the contrary promotes its corrosion. This question is only a particular case of the following general question—viz. if there be three metals, A, B, C, whereof A is electro-positive, and C electro-negative, with respect to B, and capable of forming various alloys, $2A+C \ldots A+C \ldots A+2C$: then if B be immersed in a solvent fluid in the presence of A, B will be electro-chemically preserved, and A corroded, and *vice versâ*. If B be so immersed in the presence of C, B will be dissolved or corroded, and C electro-chemically preserved; the amount of loss sustained in either case being determined according to Faraday's "general law of Volta-equivalents." The tables show that the loss sustained by cast iron in sea water, as compared to the loss sustained by an equal surface of the same cast iron in contact with copper, is 8.23 : 11.37; and when the cast iron was in contact with an alloy containing 7 atoms of copper and 1 of zinc, the ratio was 8.23 : 13.21; so that the addition in this proportion of an electro-*positive* metal to the copper produces an alloy (a new metal, in fact) with higher electro-negative powers, in respect to cast iron, than copper itself. The author discusses many results equally remarkable, and is therefore enabled to suggest by its chemical notation the alloy of "no action," or that which in the presence of iron and a solvent would neither accelerate nor retard its solution, one of the components of this alloy being slightly electro-negative, and the other slightly electro-positive, with respect to cast iron. These results will also enable some advances to be made towards the solution of the important problem proposed by the author in his former report, viz. "the obtaining a mode of electro-chemical protection, such that while the metal (iron) shall be preserved, the protector shall not be acted on, and the protection of which shall be invariable. Another table exhibits especially the results of the action of sea water on cast iron in the presence of copper and tin or their alloys. It appears that copper and tin being *both* electro-negative with respect to cast iron, all their alloys increase or accelerate the rate of corrosion of cast iron in a solvent, though in very variable degrees; the maximum increase is produced by tin alone, thus indicating that this metal (contrary to what was previously believed) is more electro-negative to cast iron than copper. Hence the important practical deduction, that, where submerged, works in iron must be in contact with either alloy, viz. brass or gun metal; common brass, or copper and zinc, is much to be preferred. These experiments will also

serve to demonstrate the fallacy of many of the patented so-called preservatives from oxidation, which are brought before the public with so much parade. The author lastly proceeds to the subject of the specific gravity of cast iron, tables of which are added to the preceding. The specific gravities here recorded were taken on equal sized cubes of the several cast irons cut by the planing machine, from bars of equal size, cast at the same temperature in the same way, and cooled in equal times. Many of these results differ considerably from those given by Dr. Thompson and Mr. Fairbairn; which the author refers to the probability that those of Dr. Thompson were taken from pieces of the raw pig, and those of Mr. Fairbairn by weighing in air equal bulks cut from the mass by the chisel and file, by which latter process the volume is liable to condensation. The experiments of Mr. Fairbairn and Mr. Eaton Hodgkinson seem to show that the ultimate strength of cast iron is in the ratio of some function of the specific gravity dependent upon the following conditions: viz. 1, the bulk of the casting; 2, the depth or head of metal under which the casting was made; 3, the temperature at which the iron was poured into the mould; and 4, the rate at which the casting was cooled. In another table all the irons experimented on are arranged in classes, according to the character of the fracture: for which purpose the terms—1. silvery, 2. micaceous, 3. mottled, 4. bright grey, 5. dull grey, and 6. dark grey, have been adopted by the author as a sufficient basis on which to rest a uniform system of nomenclature for the physical characters of all cast irons, as recognizable by their fracture; and it is to be wished that experimenters in future would adopt this or some other uniform system of description, in place of the vague and often incorrect characteristics commonly attached to the appearance of the fracture of cast iron. A twelfth and last table contains the results of a set of experiments on the important subject of the increase of density conferred on cast iron, by being cast under a considerable head of metal, the amount of which condensation had not been previously reduced to numbers. It shows this increase of density in large castings, for every 2 feet in depth, from 2 to 14 feet deep of metal. A very rapid increase of density takes place at first, and below 4 feet in depth a nearly uniform increment of condensation. The importance of these results is obvious; for, if the ultimate cohesion of castings is as some function of their specific gravity, the results of experiments in relation to strength, *made on castings of different magnitudes, or cast under different heads*, can only be made comparable by involving their variable specific gravities in the calculation.—*Trans. Ins. Civ. Eng.*

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The first meeting for the session of the Royal Institute of British Architects was held on Monday evening, the 7th inst., and most numerously attended; Earl de Grey in the chair.

Several scientific individuals residing abroad were unanimously elected honorary and corresponding members.

Charles Fowler, Esq., Honorary Secretary, read a list of some scarce works which had been presented to the institution, amongst which was one by Vitruvius, published in Italy in the 16th century, containing a description of a paddle-wheel and some motive engines, evincing the progress in mechanical science at that period.

An interesting communication on Gothic architecture was read by Mr. Poynder, illustrated by a series of drawings and plans, intended to prove that many complications of that order, which have been considered unnecessary, were designed by the early architects as a greater stability to the structure.

A drawing and plan of a splendid palace in the north of Europe, deposited by C. Tottie, Esq., was exhibited, as also an elevation of an old mansion-house still extant in England, and supposed to have been built by Inigo Jones, before the erection of the Banquetting House, Whitehall. A descriptive letter was read from C. J. Richardson, Esq., by whom the last-named drawing was made and presented.

Mr. Nottingham laid before the meeting specimens of Mr. Potts's newly invented rail moulding for hanging pictures, and pointed out to the members the great superiority of the rail over the ordinary rod hitherto used.

Thanks were voted to the respective contributors and to the noble chairman, and the meeting was adjourned.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

James Roberts, of Sheffield, Merchant, *for an improved mode of fastening certain kinds of horn and hoof handles to the instruments requiring the same.*—Enrolment Office, Nov. 28, 1840.

These improvements relate, in the first instance, to horn handles for knives, forks, &c., which are composed of two pieces or scales. The horn being softened by heat, is pressed between a pair of dies or pincer moulds, which leaves a long deep cavity on the inner side; two dove-tailed pieces are riveted, one on each side of the tang of the knife or fork, which are forced into these cavities while the horn is in a soft state, by placing them in a clam or vice. In some cases, three double-headed studs are also forced into cavities in the horn, giving an

additional hold to the handles. 2ndly. When solid handles of these materials are to be used, they are to be bored down the centre; the tang having been serrated or notched, is driven into the horn while it is still soft, and closed upon the tang by pressing between dies as before described.

The claim is, for the fastening of softened horn and hoof handles, whether in the form of scales or solid, to knives and forks, by pressing the said softened horn or hoof over, round, or into projections or cavities formed on or in any way applied to the tang or any part answering to the tang; which mode of fastening is more durable than any plan before adopted, and supersedes the use of resin, so that the said knives and forks are enabled to be washed in hot water without the handles coming off, or becoming loose.

JOHN GEORGE SHUTTLEWORTH, OF FERNLY-PLACE, GLOSSOP-ROAD, SHEFFIELD, GENTLEMAN, *for certain improvements in railway and other propulsion.*—Enrolment Office, Nov. 28, 1840.

The contrivance of this gentleman bears a very close resemblance, in many parts, to the atmospheric railways long before the public, except that in the present instance the patentee proposes to employ a denser fluid (water) as the motive power. A horizontal main or tube is laid along the line between the rails, having a slot or opening on its upper surface; this aperture is smallest at the top, and expands downward. A piston fits the interior of this tube, and terminates in a peculiarly formed guide-neck, for taking up and applying to the aperture in the pipes a continuous flexible valve or stuffing of india rubber or other suitable material. In front of the guide-neck there is one vertical and one horizontal wheel, to guide the piston steadily along the line with the smallest possible quantity of friction; while a thin metal plate passes up through the opening, and is attached to a railway carriage of the ordinary construction. At the commencement of the line, a vertical pipe conveys a column of water on to the horizontal main, through a valve or cock opened or shut at pleasure. The efficiency of this agent may beproduced by the pressure of an elevated reservoir, or by the application of steam power to force it into the pipes. On turning the cock the water rushes into the main, and drives the piston, with the carriage to which it is attached, forward; the flexible valve, which lies along the bottom of the main, but passes through the guide-neck and up over the piston, is raised as the piston travels along, and forced into the opening of the pipes, where it is kept by the pressure of the water behind the piston.

The claim is—1st. The application of the power of a column or body of water acting against a piston in a tube, to which piston a railway carriage, or other object to be propelled, is fastened for the purpose of propulsion. 2nd. The improved guide-neck to the said piston for raising and conveying to its proper place the flexible valve or stuffing required to fill the slot or space left open in the upper part of the propelling tube for the passing of the plate.

FRANCIS GREAVES, OF RADFORD-STREET, SHEFFIELD, MANUFACTURER OF KNIVES AND FORKS, *for improvements in the manufacture of knives and forks.*—Enrolment Office, Dec. 7, 1840.

These improvements relate to the manner in which handles are to be affixed to the blades of knives and forks, which the patentee proposes to accomplish by means of a detached metal bolster. This bolster has a socket of thick metal at one end for the reception of the blade of the knife, &c., and a thin one at the other for the reception of the handle. A solid handle of ivory, horn, wood, or other substance, having been cut and shaped, is bored down the centre, and a deep groove or indent cut round its upper part; the knife blade is then affixed to the socket by soldering or drilling, as may be preferred, and the tang cemented to the handle with resin in the ordinary way; after which the edges of the thin metal socket are to be pressed down into the groove or cavity made to receive them, or over a rim or projection on the handle, so as to hold them firmly together. The bolster is to be so formed as to preserve the "balance" of the handle, and may be of any desired metal.

NOTES AND NOTICES.

Railroad Collisions.—The disastrous effects of collisions of trains might be greatly diminished or altogether prevented, if each train were preceded and followed by a collapsing platform carrying a stack of brushwood fascines or other compressible materials. The momentum of the heaviest and fastest trains would be absorbed (so to speak) in squeezing up these stacks, if they were made of sufficient bulk. We know that even the shot of battering guns may be arrested by such means, and may therefore fairly anticipate that no great difficulty would be found in availing ourselves of this simple method of averting the appalling events which have so frequently occurred of late.

K. H.

The Navigation of the Atlantic by Steam was in 1838 ridiculed as an impossibility; in 1839 it was accomplished; in 1840 vessels steam between Great Britain and the United States as regularly as between London and Leith; and in 1841 it is calculated that there will be 42 steamers, of the total burden of 58,260 tons, employed in this traffic alone. —*Mechanics' Almanack.*

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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SIR GEORGE CAYLEY'S MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES.

Fig. 1.

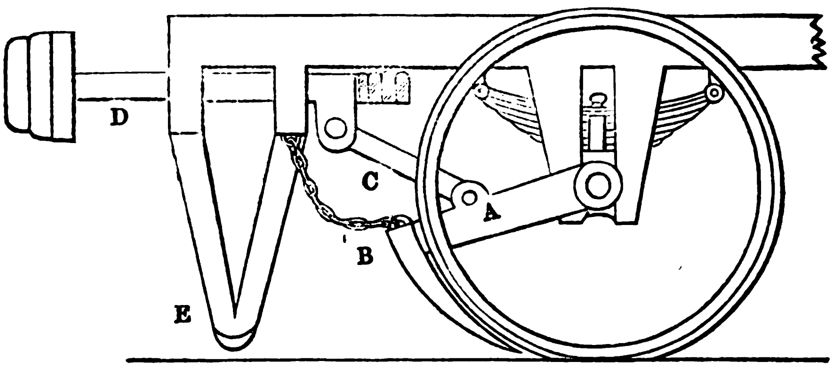
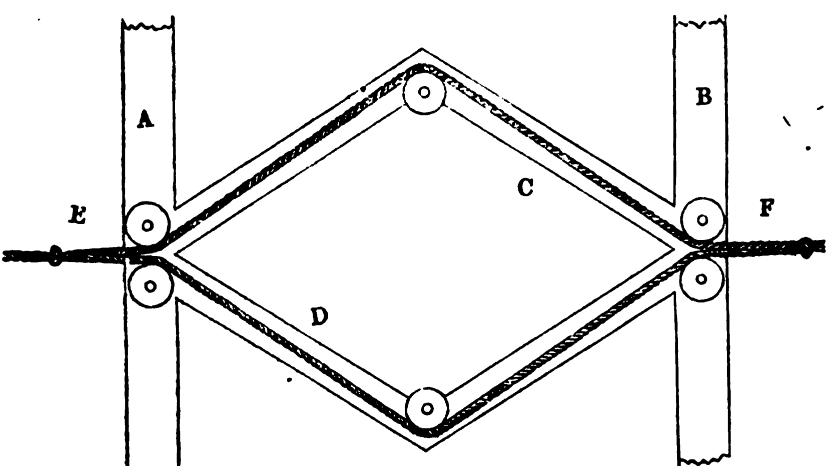


Fig. 2.



ESSAY ON THE MEANS OF PROMOTING SAFETY IN RAILWAY CARRIAGES.

BY SIR GEORGE CAYLEY, BART.

[Continued from page 468.]

It may be thought superfluous to place a general buffer behind the trains; and if *every* train be provided with one in front it would be unnecessary, but engines unattached to anything are frequently moving about, may escape, and with unrestrained velocity run in upon a train at rest. If this be too remote a contingency to deserve notice, the hind buffer may be dispensed with—however agreeable it may be to have two buffers between us and danger in most cases, and certainly one in all. It may be thought, in lieu of the air buffer, which is necessarily of considerable weight, that a series of mattresses being lighter, and of course not absorbing so much engine power to propel them, would be preferable; but it ought also to be considered, that the leading vehicle in a train, in proportion to its lightness is more readily thrown off the rail and thus gives a wider range to accident, which it is our great object to avoid. The pads of the air buffer, as before described, show a flat face, which, upon the whole, I think likely to prove the best form; but they might in front have the form given them of a gothic arch, for the double purpose of obviating the resistance of the air, one of the great impediments to velocity, and the better to cast light objects, or human beings, off the line of the rail with an oblique and less forcible blow: but here again the same objection arises—we are increasing the risk by a side force of driving the buffer carriage off the rail. These are matters deserving of serious inquiry; and which scarcely any thing but practice can finally determine.

When we meet a train coming at full speed on another set of rails, the rush past is really terrific; and conveys an idea that were they to meet on the same rails nothing could save either from destruction. There is quite terror enough in the public mind on the subject of railways; and it is therefore well to make calm estimates of the degree of danger attending even such cases of possible occurrence as this. Paradoxical as at first it may appear, the shock to each train in this case, if of equal weights and velocities, would not be greater than if it had gone against any solid object; for if the elasticity of the buffers be supposed perfect, each train would rebound with the same velocity it advanced; and the retardation at the moment, of each from the other, is just sufficient to furnish the resistance necessary to produce that equivalent rebound.

If equal trains meet, having unequal velocities, say one at ten miles per hour, and the other twenty, they will average the shock between them, the slow train getting more shock than it would against a solid object and the other less.

Heavier trains meeting light ones with the same velocity will communicate the greater share of the shock to the lighter ones—for the momentum of each after the shock will be equal; and of course the velocity of the rebound, which is the cause of danger to passengers, will be greatest in the lighter train.

There is one case truly terrific in the meeting of trains, and that is, if, when on different rails, any very strong portion of one carriage firmly chained to the rest, should, from getting displaced, catch some weaker portion of the other train, the latter would successively give way, and the whole force of both trains be expended in the work of devastation. Fortunately this is a most remote contingency, and may be rendered, by precautions that will be pointed out, almost impossible.

Having taking a cursory view of general train buffers, there is something yet to be considered in a minor way respecting the application of elastic matters to secure safety to passengers.

The padded cushions on all sides of the first class carriages should, in a coarser, but not less efficient way, be extended to all carriages for passengers, for each man's life is equally valuable to himself, and it may easily occur that the better man may be killed in the worst carriage.

It was very properly suggested lately in some of the public papers, that railway carriages should be fitted up for only single rows of passengers, so that no one should sit opposite to another. I have always held this opinion, and feel more confirmed in it than ever, by finding that others agree in it. As the feet of one set might pass under the seats of those in front of them, little space would

be lost by this arrangement when new carriages have to be built. In the mean time, some one has suggested a broad padded belt to be placed in front of each passenger, to retain him in his place in case of accident, and to prevent a collision with each other. How John Bull may relish this sort of straight waistcoat I do not know; but perhaps some modification of it for his own safety may be tolerated.

If single rows of passengers be adopted, a few carriages might also be fitted up on the same principle for night trains, with horizontal berths one above the other, to sleep in, as in packet boats. These would at all times be of important use to invalids and elderly persons, and if well padded on all sides, would be as secure as the nature of the case permits.

There is one point that seems unaccountably to have escaped the notice of railroad engineers—and that is, placing the engines under regulation as to velocity, by the usual mechanical means. The common expanding centrifugal force regulator, for cutting off the steam when the engine is going too quick, is as applicable to railroad purposes as to engines in any other situation. The directors may agree that no trains shall on any pretence be permitted to go at more than a given number of miles per hour; let them set the regulator accordingly, and let it be locked up in a case of which they have the keys; the result would be certain in every case. But where the declivity is such as to cause a greater velocity without engine power, the regulator might be so connected with a lever that when the steam was cut off, it should liberate the catch of a forcible spring break upon the wheels of the engine; a matter which any of our common engineers could contrive if required.

The next subject of serious importance to the safety of railway travelling is to have such a mechanical arrangement as will cut off the free action of the wheels from the moment of receiving any shock; and also to have the power of so doing at any time according to the will of the conductor when he perceives danger at hand. This may be done in several ways, and some drawings for this purpose were prepared by Mr. Worsley and myself last year. I understand the subject is now taken up by Mr. Stephenson, under whose auspices it can scarcely fail to be ripened into practice.

To elucidate the subject, rather than to submit a perfectly matured plan for the purpose:

Let fig. 1 represent the front wheel and end of a railway carriage-frame. On the axle of the wheel let an arm A, terminating in a concentric shoe B, turn freely. Connect this arm by the rod or link C, with the shanks of the buffer D, which is held in its place by the buffer spring E. It will be evident from this arrangement that when the buffer is pressed back, the point of the shoe B, will approach the rail, and if further pressed, the wheel will get upon it and the carriage instantly be on the drag; and this can be made to take place at any required degree of force applied to the buffer.

To get off the drag the carriage must be slightly backed, to which there will be opposed no resistance. The perforation in the arm of this drag to receive the axle must be a little elongated in the direction of its length, so that the wheel, which must not touch the drag when not in action, may by its own weight rest firmly upon it when brought under it. A spring may perhaps be found requisite to regulate this simple process. If the two front wheels be thus converted into sledges whenever any serious resistance occurs to the train, perhaps it may be sufficient; but if required, the hind wheels may undergo the same change, by connecting similar drags applied to them with the front movement. As the front wheels, however, are so readily made available as drags by the involuntary action of the buffers in times of accident, it will probably be best to furnish the hind wheels with a similar apparatus to be put into action at the will of the conductor of the train. A little difficulty arises in conveying the pull of a chain or cord from the place where the conductor stands to the carriages at a distance from him, because the play of the buffers keeps continually altering the distance of the carriages from each other. To obviate this difficulty, let A and B, fig. 2, be the hind part of the frame of one carriage and the front frame of another, between where the buffers keep them asunder. Suppose C D to be a jointed parallelogram framework, so made as to be put on at pleasure by a

couple of bolts, and carrying guide pulleys for the rope or chain E F, which is divided into two portions to follow the form of the frame, and unites again on the other side. By this arrangement, it is plain, that although the jointed parallelogram frame can accommodate its diagonal length to every play of the buffers, still each of its sides continues to be of the same length, and hence the chains that correspond with them will neither shorten or elongate as respects the distance of its two extremes E and F, from the frames A and B, so that a steady tension can be transferred from the conductor throughout all the train, if furnished with these parallelogram frames properly fitted up for retaining the chain or rope in the pulleys; consequently the drags on the hind wheels can by this means be brought to act, at the will of the conductor, in every variety of distance each carriage may chance to be from another, at the time the drags are wanted.

Another great branch of inquiry respecting railroad carriages is how best to secure them from getting off the rails, and many things might perhaps be suggested for an entirely new work, but the main question is, what can be done as things are now arranged? and without some additional means nothing can be done but by precautionary measures on this head. Should the railroad companies by their own power, or by the assistance of Government, not weighing money against life, choose to fill up the interval between the rails, excepting near stations, with masonry well clamped together (or even strong oak sleepers near each wheel, if nothing more can be afforded), great additional security would be gained; and such a wall would be the means of keeping men and cattle out of the path of the carriages. Should a wheel break down or come off, much additional security would also be derived by having four feet to each carriage, one of which is represented at F, fig. 1, which would sustain the carriage like a sledge as soon as the wheel in its vicinity failed, and not cause any friction by touching the rail before its services are required.

(To be continued.)

PLAN FOR PREVENTING RAILWAY CARRIAGES BEING THROWN OFF THE LINE.

Sir,—The recent numerous and fatal railway accidents call loudly for some improvements in the railway system, and increased protection to railway travellers, and I beg to suggest through the medium of your journal (should you think it worthy) a plan for preventing locomotive engines and carriages from running off the rail. My suggestion is this; that between the rails the whole length of the line, there should be laid a wooden rail, say 6 inches wide, and that to the front piece of the framing of the engine, there should be fixed, turning on its centre, an iron wheel with a deep groove in it. This wheel to run directly over the wooden rail, but not touch it, so as to cause no increase of friction. It might be applied to the hind part of the tender, and also to the carriages.

I am, Sir,
Your most obedient servant,
M. B. L.

November, 1840.

IMPROVED RAILWAY CARRIAGE LINKER WITH PERMANENT TAIL-ROPE.

Sir,—Having seen in page 440 of the present volume of the *Mechanics' Magazine*, a description of a linker for railroad carriages, I beg leave to send you a plan which I devised some months since, by which I think the present inconvenient system (adopted on the London and South Western, and I believe on other railroads) of stopping the trains to attach a tail-rope for the purpose of allowing the engine to go on another line might be avoided, as, if the train approached at a moderate speed, there would be time enough to shift the metals between the engine and train without stopping.

Should you think the above worthy an insertion in your Magazine, you will oblige

A CONSTANT READER.

P.S. The above may be attached to the tender or the first carriage of the train.

Southampton, Nov. 17, 1840.

[The contrivance of our correspondent consists in adapting to the "*Linker*," shown at page 440, a small drum upon which the tail-rope is wound; this

drum is kept from turning by a sliding bolt; a prong descends from the foot lever just in front of the bolt head; upon pressing down the lever the carriage is disconnected, and at the same time the bolt withdrawn, leaving the drum free to revolve, and the rope to run out. No provision seems to be made for severing the rope in case of accident, but this might be easily accomplished.—Ed. M.M.]

SIEVIER'S PATENT ROPE.

Sir,—Presuming that your readers will feel gratified by an account of Mr. Sievier's newly introduced patent rope, I take great pleasure in laying before you and them the following short notice of it.

Siever's patent wire rope is composed of alternate layers of yarn and wire, platted with exquisite skill, and the angles of the wire so minutely formed, that when strained they become nearly straight lines. This intermixture of materials is so pliable as to work freely over a sheave of the same size as ordinary rope of the same diameter, whilst its compactness can be carried so far as to make it nearly as solid as a bar of iron, without detracting from its flexibility. It is also worthy of particular notice that it leaves little or no indentation on the surface, which the common hemp does to a considerable extent, and as the angles of the wire are so arranged as to prevent the rope from elongating to any serious extent, it will never *kink*, nor require a swivel to relieve the twist or strain to which, for instance, the rope on the Blackwall railroad is liable. This new compound material is capable of unlimited extension, so that a rope of any length may be produced without splicing, thereby guaranteeing an uniformity of consistency and strength.

The results of experiments tried in H. M. Dock-yard, Deptford, was as follows:—

	Tons.	Cwt.		
5¾ best white hemp broke at	12	13		
5⅝ ditto ditto tarred at	9	8		
	T.	C.	Q.	lbs.
Patent wire rope 4⅝ broke at	15	18	2	12

showing the relative strength as follows:

Best white rope	10,800
Ditto, tarred	9,309—8
Patent wire rope	19,925

The rope thus tested was composed of three coatings of wire and two coatings of hemp.

I ought to mention further, as a recommendatory feature, that in all cases of wear and tear, whether from age or when cut through by accident or design, the outer coat can be removed and a new metallic covering supplied, whereby the old rope is equivalent to a new one, and this is effected at a trifling expense and trouble.

Upon the whole the new rope appears to be constructed on the most accurate principles, and is evidently the production of a mind perfectly cognizant of all the properties required. Its capabilities are coextensive with its utility, for when strength, flexibility, and compactness are combined, the acme of perfection in rope making has been undoubtedly obtained. Simply considered as a specimen of the arts, it is singularly beautiful and attractive; adapted, however, to the minutest as well as the most stupendous machinery, its importance can hardly be overrated.

I am not aware whether this manufacture is sufficiently advanced to have become an article of commerce, but its use is too important to the whole engineering community to remain long inactive.

I am, Sir,
Your obedient servant,
NAUTICUS.

Tottenham, Nov. 10, 1840.

DURABILITY OF BLACK AND WHITE PAINT.

Sir,—Permit me to make a few remarks in reply to your correspondent's observations on the seeming contradiction of two writers respecting the use of black and white paint for outside wood-work. It is a subject to which I have long paid great attention, and, from observation, I can safely state that both parties are right, although so opposite to each other. Black paint being made of lamp black, which is a pure kind of charcoal, may almost be said to be indestructible—the elements seem to have little or no effect on it; in proof of this, let any one notice a direction post placed at a corner where two roads meet, and if it has not been painted for a number of years, he will find that the white paint which formed the groundwork has completely perished, while the black which

constituted the letters, remains in a good state of preservation; indeed this is frequently so much the case, that the letters are actually left in relief, owing to the softer parts of the deal having been destroyed by the sun and rain, after the white paint has been carried away by the same powerful influence. On the contrary, if a board has been painted black, and written with white letters, the letters will in a few years disappear, but the groundwork remain unaltered, fully proving that white lead is far less durable than lamp black.

Now then for the disadvantages. As it is well known that all black bodies absorb heat, while white ones reflect it, so we find that doors, shutters, &c., if painted black, shrink and crack much more than white ones, and the paint is more liable to blister; this will readily account for ships requiring more repairs if painted black than they otherwise would do. From hence I think we may come to the following conclusions:—First, that woodwork which is framed together, and consequently liable to injury from shrinking, should never be painted black on the side exposed to the south. Secondly, that black is the most durable colour, and may with safety be used for a northern aspect, or for any boards that are not confined, but have sufficient room allowed for shrinking and swelling.

Should you deem these observations worthy a place in your journal, the insertion will oblige

Your obedient servant,

R. N.

Hitchin, Herts, Dec. 14th, 1840.

PRESERVATIVE PROPERTY OF SULPHATE OF COPPER.

Sir,—With reference to the Paper by Mr. T. B. Hartley, "On the Effects of the Worm on Kyanized Timber exposed to the Action of Sea Water," in No. 903 of your valuable Magazine, it appears, that timber so prepared, and employed in the construction of the Entrance Gates of the Liverpool Docks, was found unequal to resist the attacks of the Teredo Navalis; English elm, however, steeped in a strong solution of sulphate of copper from the Parys copper mines in Anglesea, was found, after three years immersion, to be very slightly injured; while unprepared timber, as well as Kyan's, similarly situated, were quite destroyed. I was not before aware that the sulphate of copper had been employed for such objects; but had noticed its valuable property of preserving timber from decay in the copper mines of Cornwall; in certain situations of the lively and old workings, where it had for many years been exposed, both to the influence of the atmosphere, and to the vitriolic waters constantly percolating through the "Attal," or waste materials supported by the timber. Some importance may be attached to the above circumstance, inasmuch as these accumulations must inevitably have given way in the lapse of time, and choked up the channels of ventilation, had the timber decayed.

In the lead mines of Derbyshire, on the contrary, where this fluid is wanting, I remarked that timber employed for like purposes, was more or less decayed, and that the descent by the rude ladders, to the workings, was extremely dangerous on account of the decay of the ends of the rungs, or trundles, inserted in the rocks.

Now, as these mineral waters abound in Cornwall, in Anglesea, and indeed in all situations where copper is to be found, it appears to me, that a comparison in such localities, of timber so saturated, with that prepared after Kyan's process, and used, for example, as railway bearers, paling, &c., would be well worth the trial; as it might possibly lead to the profitable employment of a fluid, which now, for the most part, is allowed to run to waste.

I am, Sir, your most obedient servant,

NAUTICUS.

Woolwich, Dec. 4, 1840.

NEW DESCRIPTION OF CONCRETE FOR THE FORMATION OF ROADS AND STREETS.

Sir,—Allow me through the medium of the *Mechanics' Magazine*, to solicit the attention of that part of the public who are interested in the construction of roads and pavements to the following remarks on that important subject.

After the various plans which have been adopted and the immense sums that have been expended in the metro-

polis and other places for the accomplishment of that desirable object, namely, a durable and economical pavement, I am prompted by the flattering testimonials I have received and the advice of my friends to make a public announcement of my plan of road making.

I have long been convinced that if a method could be discovered to cement the materials used in making roads instead of the dirt and sand which is thought necessary, it would be very desirable.

I believe it is well understood that neither gravel nor granite stone will set without a portion of dirt and a certain quantity of water. I say a certain quantity of water, because if there be either too much or too little, it is well known that the dirt which cements the material is not in a proper condition, and even when it becomes solid, it still requires a certain quantity of water to keep it so, or else, in very dry weather, turns to dust, and after rain becomes almost liquid or like a thick batter.

The pressure of the traffic forces the mud to the surface, which stiffens by exposure to the air, and soon becomes a thick coating of dirt. Now this will continue so long as it remains wet, because just as deep as the wet has penetrated the whole material of the road will be in motion. I have known roads that have been laid ten or twelve inches thick with material taken up again in a few years, when, in order to get out all the material that was first used, it has been found necessary to go to the depth of at least two feet, its motion having extended to that depth. It is neither on the gravel nor on the stone that the weather acts so powerfully, but on the dirt by which they are cemented; for it is well known that gravel lying in a river or stone in a watery quarry, is quite as hard as when taken out and dried.

To remedy these evils I have devoted much time and attention, and after many trials of materials of various kinds I have ascertained that coal or gas tar in its raw state, being a resinous substance and not acted upon by water or air when mixed with other materials in proper proportions—then mixed with the granite or broken stone as a substitute for dirt or sand and applied in the manner I have discovered—is most decidedly an excellent and economical concrete for the formation of streets and roads. To prove that such is the case, I refer to the south entrance into the town of Nottingham, certain portions of which have been formed upon the above plan, and after twelve months trial it is now a very superior piece of road, not affected either by frost or by any change in the atmosphere. I have also received directions to take up several streets and reform them upon my plan, which is a practical demonstration of its utility.

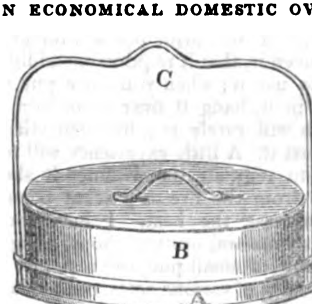
The composition is equally applicable to a variety of other purposes such as *gentlemen's carriage-roads, foot-paths, garden-paths, court-yards, stack-yards, manure-yards, barn-floors, stable-yards,* &c., and, indeed, any situation where a clean and smooth surface is required.

I am, Sir,
Your obedient servant,
THOMAS SMART.

Nottingham, December 8, 1840.

P.S.—I will just add, that I have carefully watched, in all weathers, the roads I have made in the manner above stated, and am fully convinced of their superiority even over roads formed with wood, in affording a safe footing for horses, which is not the case with wood pavements in wet weather.

AN ECONOMICAL DOMESTIC OVEN.



Sir,—As I know your pages have ever been open to any communication that might contribute to the information, or advantage of the working classes of your readers, as well as those upon the higher branches of science, I trust you will favour me with a small space for a description of a small economical domestic oven which I have been using for several years, and have found exceedingly useful and convenient. I am one of the

working classes, and live at a distance from my manufactory. I dine in my warehouse every day, and have found it contribute to my comfort in giving me a hot dinner whenever I wish it. I am persuaded that many others who are similarly situated, as well as every poor family, who have not always the common conveniences of cooking at home, would find this a very useful article, and the price inconsiderable. Indeed, there are many working men in this and other manufacturing towns who could make one for themselves, as little more than a piece of sheet iron is necessary. The bare inspection of the drawing above will show its construction. A is the bottom, 1½ inch deep, and 11 inches diameter. B is the cover, 4½ inches deep, and fits easy within the bottom, but close and even round the edge, to keep out the smoke. C is the handle, sufficiently high to admit the cover to be taken out and put in with convenience; and there is a moveable small hoop of sheet iron, about 5 inches diameter and ¾ of an inch deep to put the dish upon, and keep it from the bottom to prevent burning. These are the dimensions of my oven, and it cost me three shillings.

The top should not be more than 4½ inches, or 5 inches deep, as this keeps the hot air close upon the meat, and makes it brown in roasting.

One of the principle advantages of this oven is, that it requires no additional fire to use it; when you have put your meat in it, hang it over a common fire, which will rarely require even stirring, to roast it. A little experience will teach how to regulate the distance it should hang from the fire to prevent burning, or increase the heat. I have cooked beef-steaks and mutton-chops, a pigeon, a rabbit, a small pudding and pie, sausages, fish of various sorts, not too large; every thing too, clean and nicely done; and it roasts potatoes to admiration. All that is necessary to keep it in order is to have it well washed and made clean every time it is used.

I am, Sir, respectfully,
Your obedient servant,
DEMOPHILUS.

Birmingham, Nov. 19, 1840.

SECOND PROOF OF PROPOSITION XXIX, BOOK I OF EUCLID, INDEPENDENTLY OF AXIOM XII.*

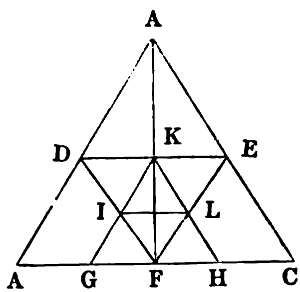
Sir,—The corollaries to Proposition B (which follows) will render obvious my reason for choosing the isosceles, in preference to the equilateral, triangle. It will be seen that from the former, the proof of the equality of the three angles of any triangle to two right angles is directly deduced, without the intervention of subsidiary propositions.

NAUTILUS.

8th December, 1840.

Prop. B. Theor.

The straight lines, joining the points of bisection in the sides and base of an isosceles triangle, divide it into four interior triangles, any one of which is equal to another.



Let A B C be an isosceles triangle, bisected on the sides and base at the points D E F; join D E, D F, E F. The triangles D A E, D F E, B D F, C E F, are equal and similar.

Join A F, and because A F is drawn through the vertex, and bisects the base, of an isosceles triangle; it is perpendicular to the base, and bisects the vertex (8th of 1st). A F also bisects D E, and is at right angles with it, because A F bisects the vertex of the isosceles D A E, whereof D E is the base; the triangle D F E is isosceles by Prop. A.

Bisect D F, E F, in I and L; join K I, K L; and because the triangles D I K, K L E are equal (Prop. A.), so also are the angles D K I, E K L; therefore the intervening angle, I K L, is bisected by the perpendicular A F. Join I L, and

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* This is the additional proposition promised by our ingenious correspondent "Nautilus" in his last communication (No. 905, p. 557), which ought to have been dated 6th November. ED. M. M.

because I L joins the points of bisection in the equal sides of the isosceles D F E, therefore it is at right angles with, and bisects, its perpendicular K F (Cor. to Prop. A.) Produce K I, K L to meet the base B C in G and H; then because in the two triangles G K F, H K F the angles at K are equal by bisection; the angles at F, right angles; and the side K F common to both; therefore K H is equal to K G (26th of 1st), and G K H is an isosceles triangle, whereof F K is the perpendicular; but F K is at right angles with, and is bisected by, I L: therefore I L bisects the sides K G, K H of the isosceles G K H. (Cor. to Prop. A.)

Because I is in the bisection of K G, K I is equal to I G; and because I is also in the bisection of D F, D I is equal to I F; but the angles at I are equal and vertical, therefore the triangles D I K, G I F, are equal, and also their bases D K and G F: and since the triangle G I F is isosceles (Prop. A.), its side I G must terminate in the bisection of B F, because I G is equal to I F, and is drawn from the bisection of the side D F of the isosceles B D F, whereof B F is the base; and there cannot be more than one straight line drawn from the point I, terminating in B F, which shall be equal to I F.

Therefore G F being the bisection of B F, and D K that of D E—B F, D E are equal to one another, and also to F C. Hence the bases of the four triangles D A E, D F E, B D F, F E C, being equal, and also their sides equal (by Prop. A.), the triangles themselves are equal.

Wherefore the straight lines, joining, &c.

Q. E. D.

Cor. 1st. The three angles of any *isosceles* triangle are together equal to two right angles.

Cor. 2nd. Since any right angled triangle may be made the half of an isosceles triangle, therefore the three angles of any right angled triangle are equal to two right angles.

Cor. 3rd. Since *any* triangle may be divided into two right angled triangles, therefore the three angles of any triangle are together equal to two right angles.

LAW OF THE EXPANSION OF AIR.

Sir,—A correspondent in No. 903, p. 499, of the *Mech. Mag.*, asks the law of expansion of air when heated.

According to the best observations, those of Rudberg—dry air, or any dry gas, under a given pressure, expands when heated according to the following law:—

$$\frac{\text{Volume at T° centigrade}}{\text{Volume at 0° centigrade}} = 1 + (0.003646)\,T.$$

See "Poggendorff's Annalen," vol. 41. Tables for facilitating the computation of the volume of air at a given temperature will be found in "Poggendorff's Annalen," vol. 41, p. 449, and in the 4th edition of H. Rose's "Analytical Chemistry," vol. 2, p. 740.

M. H. W.

THERMO-BAROMETER.

Sir,—It is probably familiar to many of your readers, that a new apparatus under this name is to be found at most opticians, &c., for sale, but not being able to obtain a satisfactory explanation of the principles on which it is constructed, I beg to solicit the same from some of your well-informed correspondents.

I may mention that it consists of—1st, a thermometer; 2nd, a short bent tube, open above, and ending below in a bulb containing air, which rests above the mercury that occupies the greater part of the tube.

Attached to the longer leg of the tube are two scales, of which one is fixed and graduated as a thermometer, the other sliding and marked in inches and 10ths, as for a barometer.

In using the instrument, 29½ inches on the moveable scale is brought to the level of the mercury in the bent tube, and the index of a vernier, which slides on *the moveable scale*, being brought to a point on the *fixed scale* corresponding to that indicated by the attached thermometer, gives the atmospheric pressure to 100ths of an inch.

I am desirous of ascertaining the principle on which the instrument is constructed, the chief apparent difficulty being as to the graduation of the *fixed* scale of temperature.

But there is a further difficulty in the fact that some instruments, apparently of the same construction, have the ba-

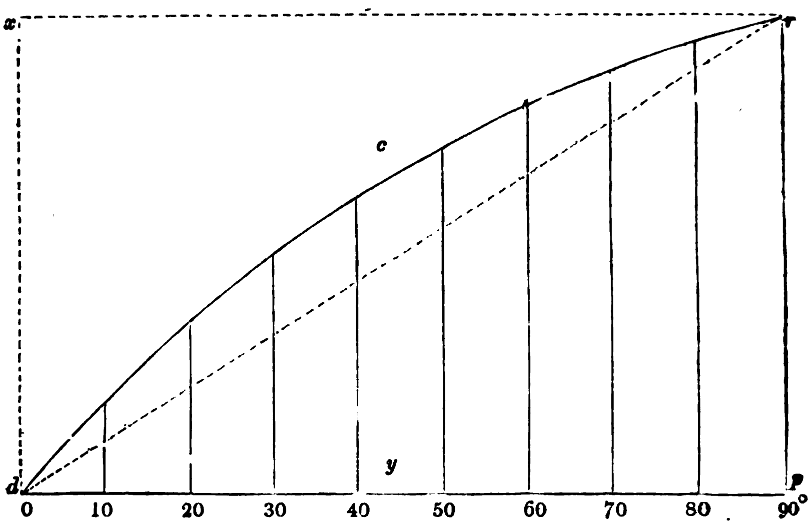
rometric scale of inches running from *above*, downwards, instead of from *below*, upwards, as described.

I may mention that the instrument appears perfectly trustworthy for ordinary purposes, and, besides its convenient portability (about 8 inches by 3), forms an ornament to the drawing-room or library table.

I am, Sir, your obedient servant,
A CONSTANT READER.

Bath, Oct. 12th, 1840.

MODE OF ESTIMATING THE POWER OF THE CRANK IN STEAM ENGINES.



Sir,—It appears to me on referring to some of the numerous communications in your valuable Magazine, concerning the loss of power occasioned by the use of the crank of the steam engine, that the mean power of the engine has been underrated, in one or two of these statements, even as low as one-half. The reason of this I will endeavour to explain. The method I shall adopt is to suppose a given line to represent a certain amount of power, and if put in motion to generate a space, which space will conveniently serve to represent the amount of work performed by the said power. As follows: Suppose the line *r p* to represent the full power of the engine, and the line *p d* to represent the circumference, or 90° of the revolution of the crank laid down in a straight line. The object of this is, that the sines of equal arcs may stand on the line *p d*, as ordinates at equal distances from each other. By this arrangement, the mean power of the engine can be obtained with the greatest facility. Now it is evident, if the line *r p* be supposed to move to *d* (which represents the dead point,) without any decrease in its length during the course of its motion, it will generate the parallelogram *r p d x*, which will serve to represent the amount of work done, the power remaining constant. *Secondly*, if the line *r p*, in moving from *r p* to *d*, be supposed to decrease in an equal ratio till it vanishes at *d*, it would generate the triangle *p y d r*, which would be half of the parallelogram *r p d x*; consequently, the amount of work done would be equal to half of what was done in the former case. But the case is different with the steam engine. The leverage of the crank at any particular position is to the power of the engine, as the right sine of the angle made by the crank and connecting rod, is to the radius of the crank: consequently, the leverage will decrease in the same ratio

as the sines. Suppose the line $r\,p$ to be put in motion, and to decrease in the same ratio as the sines of the angles, then will the upper extremity r, in moving to d, generate the curve $r\,c\,d$, which curve is termed the curve of sines, and the line $r\,p$ will generate the curved area d, c, r, p, y, d, which will exactly represent the amount of work done, and this area is equal to the square of the radius $r\,p$, or equal to .6366 of what it would have been had it been working uniformly at the full power $r\,p$. Now it will appear plain why the mean power of the engine has been understood by the method usually adopted, which is to take the amount of the sines of the angles corresponding to a given number of positions, and to divide that amount by the number of positions; but this will give the mean amount, on the supposition that the engine is at work at those particular positions only. As it is evident, however, that the engine is continuing to produce power while the crank is moving from any of these positions to the next adjoining, this method cannot give the total amount of mean power. The sines of the angles of ⅓ds. of the quadrant, viz. from 60° to 90° will all be greater than one-half of the radius; consequently, the greater number of positions taken, the greater will be the result of mean power by this method. Now the method made use of in the former part of this statement, does not admit of any loss of power whatever. The line $r\,p$ in the course of its motion to d, passes through every part of the curve, and successively representing the sines of all the corrosponding angles of the crank, the space generated by the motion of the line $r\,p$, will give the full amount of mean power, which will be equal to that which would have been produced by taking an infinite number of positions,—viz. .6366 as before, which corresponds with the amount given in two or three of the communications in your Magazine. This result exactly agrees with the well known law, that the power is inversely as the space passed over. In the present case as the motion of the piston is to the motion of the crank,—viz. .6366. The argument in the foregoing statement is founded on the supposition that the connecting rod is infinite in length; the result will not be affected by its length. With a shorter connecting rod the power will be more unequally divided. The two points at which the crank and connecting rod are at right angles will be nearer to the cylinder, thereby dividing the whole revolution of the crank into two unequal parts. In that part which is furthest from the cylinder, the angles of the crank and connecting rod will differ more from a right angle, but this will be fully compensated by the nearer approach to a right angle in the other part which is nearest the cylinder.

If the operation be reversed, by applying to the crank an uniform power which may be represented by the decimal .6366, it will communicate to the piston a mean power equal to 1, which exactly agrees with the aforesaid law. To find the power of the engine at any particular position of the crank, multiply the sine of the angle of the crank and connecting rod by the cosine of the angle of the connecting rod axis of the cylinder.

The insertion of the foregoing in your useful Magazine, will much oblige your humble servant,

J. R. Aris.

60, King-street, Stepney, Nov. 9, 1840.

PLAN FOR WORKING THE SLIDING VALVES OF LOCOMOTIVE ENGINES WITH ONLY TWO FIXED ECCENTRICS.

Sir,—A plan has long been desired for working the sliding valves of a locomotive engine with two fixed eccentrics (that is one to each cylinder) so as to give the lead correctly when the motion of the engine is reversed, that is to say, when the engine is working either way. There have long since been locomotive engines constructed with only two eccentrics,and so as to give the required lead to the valves when working in either direction; but these eccentrics used to be made to work loose upon the shaft, and when the motion of the engine was required to be changed, their situations were altered by means of levers and catches. But before the catches could get to their proper places, the shaft was obliged to be turned, nearly half way round at least; therefore, each engine was furnished with a set of rods and levers to enable the engineman to work each valve by hand until the shaft came to the proper place for the catches to go together. This plan, in consequence of

the tediousness in reversing the motion, its being so very liable to get out of repair, and other objections, has nearly fallen into disuse.

The plan now almost universally adopted, consists of four eccentrics, all of which are firmly fixed to the shaft. These eccentrics are so arranged, that two of them work the valves when the engine is going in the forward direction, and the other two work the valves when the engine is going in the backward direction. The four eccentric rods are all connected to one main lever, namely the reversing lever, and by this lever two of the eccentric rod-ends may be attached to, at the same time the other two will be detached from, the levers which work the valves. With this arrangement the starting, and reversing of the engine, are so simple as to be performed by the greatest stranger; while with the former, the engineman requires considerable practice before he can get properly into the way of starting and reversing.

A plan for reversing the motion of the engine with greater ease, and for giving the lead to the valves with greater accuracy, than that with the four eccentrics, can hardly be desired, but it has long been the study of many ingenious persons, to contrive a method from which they may obtain exactly the same result with *two fixed eccentrics*. This subject has, to my knowledge, been the cause of many experiments, some of which have, by accident, arrived pretty near to the point of correctness; but on their being performed upon a large scale, in consequence of the persons engaged in them, not being thoroughly acquainted with their ruling principles, they have been deemed incorrect. There are those who have studied this subject so minutely, and made so many unsuccessful experiments, as at last to conclude it impossible to obtain this result in the manner alluded to. I have seen several ingenious diagrams, intended to prove the impossibility, and I have even known attempts made to prove it impossible by geometrical demonstration.

I think it needless for me to enter into the details of the valve work; however, I will give a short description of the method of setting the four eccentrics, which will refresh the memory of the reader with their principles, and at the same time, perhaps, serve for as good proof of the plan I am about to describe as can readily be given.

As the eccentrics, and all the other parts of the valve work, belonging to the one cylinder are generally the same as, but quite independent of, those belonging to the other cylinder, and as each pair of eccentrics require to be set at exactly the same angles with their respective cranks, I think it will render the explanation much plainer to only take into consideration the two eccentrics belonging to one cylinder, namely, one for the forward and the other for the backward motion.

Suppose A B C D, fig. 1, to be the circle described by the crank, *a* the lever to which the eccentric rods are to be attached, E C a line drawn through the centres of the cylinder, the end of the lever, and the crank-axle; and B D another line also drawn through the centre of the crank-axle, but perpendicular to E C. Suppose the crank to be at C. Now when the crank is in this situation the piston will, of course, be at the end of the cylinder, and the lead is generally considered as the distance the valve has moved from the middle of its stroke, or as the distance it is open, when the piston is in this situation. To give this lead, when the engine is working in the direction shown by the arrow F, the eccentric must be set about *c*, and the perpendicular distance from the line B D to *c*, is the quantity of lead in the eccentric. Now when the rod belonging to *c*, namely, the eccentric rod, is attached to *a*, the valve will have the lead for working the engine in the direction shown by F, and it will continue to open until the crank arrives at G. But if the crank be turned in the direction shown at H, the eccentric will cause the valve to move in the wrong direction, and, consequently, allow the steam to act contrary to the motion of the piston. Therefore another eccentric *e* is furnished, which is set at exactly the same angle with the crank as *c*, but on the opposite side. Both of the eccentric-rod ends are connected to the reversing lever, as I before observed, by which they may be attached to, and detached from, the lever *a* at pleasure. It will be seen, by attention to the drawing, that the changing of the eccentric rods, when the crank is at C, will produce no alteration in the position of the valve; neither is it neces-

sary it should, because the piston is then at the end of its stroke, and although the crank be required to turn in the other direction, the steam will still be required to act upon the same side of the piston.

Let us now suppose the crank to be at B; the eccentrics will now be at *f*, *g*, and the piston about the middle of the cylinder. When the engine is intended to work in the direction of F, the rod belonging to *f*, must be attached to the

Fig. 1.

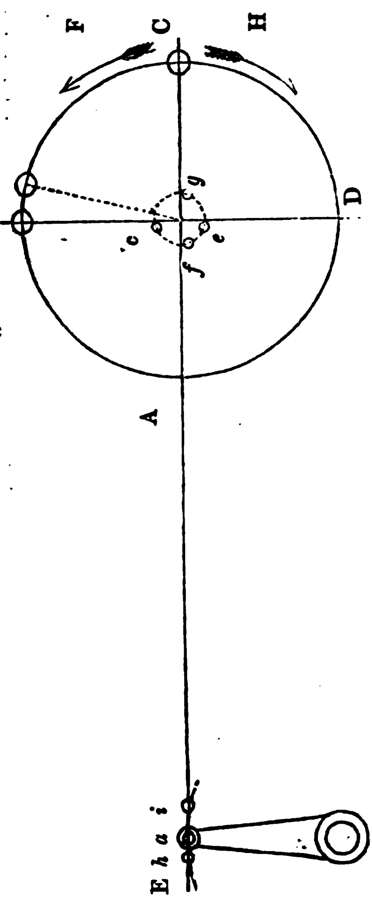
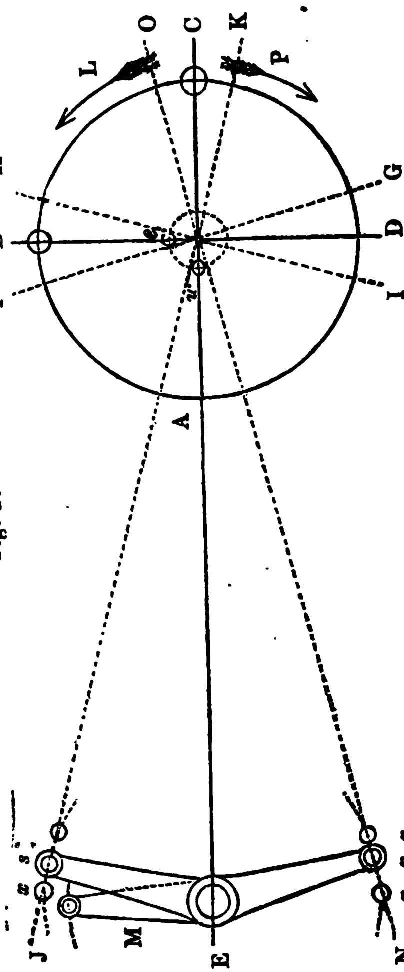


Fig. 2.



lever, which will cause it to stand at *h*, and consequently the valve will be wide open, with the exception of the little difference caused by the lead. To reverse the motion, that is to say, to set the valve for working the engine in the other direction, the valve must be made to slide, so as to open to the same extent, to allow the steam to act upon the contrary side of the piston. This is accomplished by the reversing lever which detaches the rod belonging to *f*, and at-

taches that belonging to *g*, which, by means of its forked end, draws the lever points to *i*, and consequently, causes the steam to act upon the other side of, and force back, the piston.

By a little attention, it may be seen that, while the crank is in any point of its revolution, the changing of the eccentric rods will produce that alteration in the position of the valve required to reverse the motion of the engine. Therefore, I think the two points, in which we have supposed the crank, will be sufficient to explain the manner in which the lead is effected, and the motion reversed, by the two fixed eccentrics to each valve.

I shall now proceed to explain the principles of a plan for giving the lead to the valves, and reversing the motion of a locomotive engine with *two fixed* eccentrics instead of four. In the following explanation, for the same reason as in the foregoing, I shall only speak of the valve, &c. belonging to one cylinder.

Suppose (as in fig. 1.) the circle A B C D, fig. 2, to be described by the crank; E C, a line drawn through the centres of the cylinder and crank axle; and B D, to be drawn perpendicular to E C. Suppose the crank to be at C, and the eccentric at *e*. After having determined the quantity of lead to be given by the eccentric, draw the lines F G, H I, at the same angles with the crank, as you would set the eccentrics in fig. 1, to give the same quantity of lead. Then draw the line J K perpendicular to H I, and that end of the lever to which the eccentric rod is attached when the engine is working in the direction of L, must come in this line, supposing the valve to be worked by the lever M. By a little attention it will be perceived, that by setting the end of the lever in this situation, the valve will have the same quantity of lead, as it would if the lever and eccentric were set as in fig. 1. To cause the engine to be right for working in the contrary direction, no alteration is necessary in the situation of the valve; still it would not do to let the eccentric rod remain attached to *s*. Therefore, I introduce another lever *v*, the end of which comes in the line N O, which is drawn perpendicular to F G, and, by means of the reversing lever, I detach the eccentric rod from *s*, and attach it to *v*, which will still allow the valve to have the lead, and also cause it to move in the proper direction when the engine is working in the direction of P.

Let us now turn the crank to B. The eccentric will now stand at *w*. To cause the piston to work the crank in the direction of L, the eccentric rod end must be attached to *s*, as before, which will cause it to stand at *x*, and consequently cause the valve to be wide open, with the exception of the little variation caused by the lead, as I spoke of in fig. 1. To reverse the motion, that is, to cause the crank to turn in the direction of P, I remove the eccentric rod end from *x* to *r*, and by this means (the eccentric end being properly formed,) the lever will be drawn from *o* to *n*; consequently the valve will receive the same change as it did in fig. 1, by changing the eccentric rods when the crank was B.

By setting the cranks in figs. 1 and 2, in any two corresponding points of their revolutions, it will be found that, when the eccentric rod, fig. 2, is attached to the lever *s*, the valve will be in the same situation, as that, of fig. 2, when the rod belonging to *c*, is attached to the lever *u*. And it will also be found that the change of the eccentric rods in fig. 1, will effect the same change in the situation of the valve, as the removing of the eccentric rod, fig. 2, from the one lever to the other. Hence, it is evident, that one eccentric, with the two levers arranged in the manner described, will produce the same effect upon the valve in every respect, as is now produced by the two eccentrics.

The distance *s v*, fig. 2, will depend upon the length of the eccentric rod, and the quantity of lead in the eccentric. If the eccentric *b c* required to give a greater quantity of lead than common, it will, perhaps, cause the levers *s v*, to be of an inconvenient length; therefore, it will perhaps be advisable to use two bell crank levers instead. But these particulars are of little importance; the principal thing to be attended to, is to set the ends of these two levers in the proper places.

I am afraid I am trespassing too far upon your pages; therefore, I will conclude with a short explanation of a little deviation in this latter arrangement from the former, which, before I did not think worthy of notice. When the crank is at C, fig. 1, either of the eccen-

tric rods may be attached to the lever *a*, without moving it. But in fig. 2, when the crank is in that same position, it will be found that the eccentric rod cannot be removed from *s* to *v* without making a little alteration in the levers. It would be a waste of time to enter into minute explanation of this little alteration, which is produced by the vibration of that end of the eccentric rod in connection with the eccentric—upon the same principle as the piston is caused not to be in the middle of the cylinder when the crank is at B.

I remain, Sir,

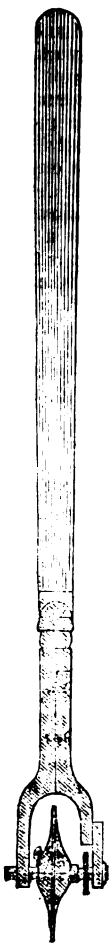
Yours very respectfully,

JOHN CHARLES PEARCE.

Leeds, Nov. 10, 1840.

IMPROVED DOTTING PEN.

Fig. 1.



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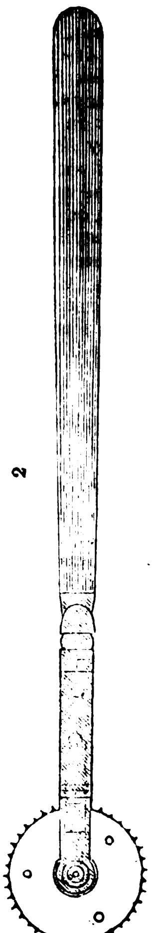
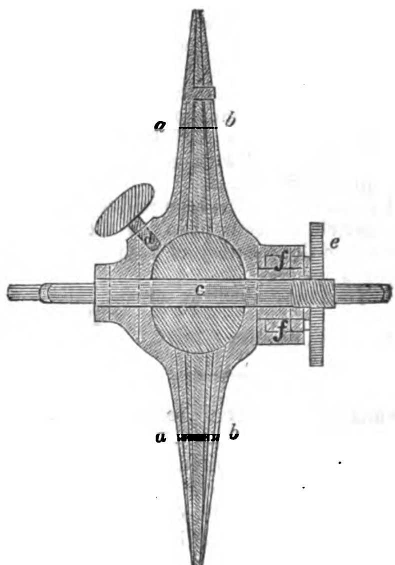


Fig. 3.



Sir, I have sketched out roughly in the accompanying drawings an idea which has occurred to me in connection with the making of dotted lines. There is not to my knowledge any instrument which even passably accomplishes the

above object, and therefore any attempt to supply what must on all hands be admitted to be a desideratum, cannot but be received with candour. Before explaining it, I will say, that I have not yet gone to the expense of having one made, but should there be no practical difficulties suggested by any of your correspondents, I shall certainly get one made for my own use.

In fig. 1 and 2 the instrument is represented of the usual size; in fig. 3 is shown a sectional view of the dotter, with observations, &c. four times the real size, for the sake of better explanation. In the larger sketch it will be seen that the dotter is composed of two thin plates, *a* and *b*, somewhat similar to a pair of cymbals; *a* is fixed to the arbor *c*; but *t*, though so attached to the arbor that it will revolve with it, is yet allowed to move to and from the other plate *a*. This movement is accomplished by means of the nut *e*, which has two prongs, *f f*, projecting from it, and working in a circular groove in the plate *b*: so that when the nut is screwed backwards or forwards, the plate *b* must of course follow, and thus the thickness of the dotted line may be regulated with great exactness, the ink is put in at *d*.

I think enough has been said to render the sketch perfectly plain. I therefore leave it to the courtesy of your readers, and remain, Sir,

Your most obedient servant,

T. C.

Manchester, December 3, 1840.

PRACTICAL HINTS IN PLASTER CASTING.

Sir,—Having acquired some time back a little experience on the subject of "J. R.'s" inquiry (in your last Number) the following may, perhaps, be useful to him.

In casting from a plaster its face must be covered with a substance that will prevent the liquid plaster from adhering when set, pipe clay is generally used and can be applied with a camel-hair brush, which may be worked against a piece of the clay with some water into a kind of lather and brushed over the surface, or a strong soap lather may be used in the same way. When the mould has set it may be separated from the original by immersing them in water until saturated, when they will easily come apart. I do not know that there is any method by which you can ensure your original from being discoloured; but by using white soap you may come very near to such condition.

In mixing the plaster it should be thrown into the water by spoonfuls and allowed to fall to the bottom before you add more, as it may otherwise become lumpy; nor should it be stirred more than necessary.

To make the mould, a portion of plaster should be put quite fluid upon the original and spread over its surface with a soft brush, by which means you remove the air-bubbles and work the plaster into the finer parts, you can then fill up to any thickness you may require.

To cast in wax, plaster moulds are used; they should be placed in warm water until saturated, taken out, and the superfluous water blown off the face by the lungs, or a pair of bellows; or the moulds may be wrapped in a dry cloth for a few seconds; the wax is then to be poured in. Care must be taken that the mould be not too dry, as the wax would be sure to tear out pieces of the plaster.

I remain, Sir,

Your obedient servant,

W. I. MIERS.

111, Strand, November 26, 1840.

INSTRUCTIONS FOR PLASTER CASTING.

Sir,—The art of copying in plaster is one of great convenience and admits of a most extensive application; it is one, however, that depends greatly for its successful execution upon the skill and ingenuity of the operator. The mode of proceeding must in all cases be adapted to the particular object in view, and little beyond general directions can be given for the purpose. I trust, however, that your inquiring correspondent, "J. R.," (page 491) will find the following remarks useful, and that they may serve in some measure to relieve him from his present difficulty.

The first preparatory step towards plaster casting, is to form a mould of the article which is to be copied; there are several methods of accomplishing this, the choice of which must be regulated by the material, form, &c., of the original. The best materials for taking mould impressions from plaster originals,

as well as from coins and medals, is a mixture of sulphur and red-lead in equal proportions (by weight); the sulphur being melted, the red lead is to be stirred in, and the two ingredients well incorporated together. Some persons prefer a smaller proportion of red lead, while others dispense with it altogether, using sulphur alone; but they are much better combined, as such moulds retain an exquisite sharpness, and are very durable. In the case of silver coins, &c. the sulphur mould must not be used, as it would tarnish and injure them. For such purposes, a composition of bees'-wax, pitch and resin may be used with advantage; or the mould itself may be formed of fine plaster, subsequently hardened with linseed oil. For temporary purposes, wax alone may be employed.

Whatever material is used, the mode of proceeding is nearly as follows:—the coin, medal, or original, is to be oiled all over with a soft camel's-hair pencil or cotton wool dipped in olive oil, taking care that the oil does not remain in any quantity in the hollows; a strip of strong paper, about an inch and a half wide, is to be wound round the edge of the medal, in the form of a cylinder of which the medal forms the base. The melted sulphur or other composition for the mould, is to be poured upon the medal, and when cold may be readily separated from it. The moulds thus obtained, are to be surrounded with a paper cylinder and oiled, as before directed; plaster of paris is to be smoothly mixed with water to the consistence of thick cream *(not Devonshire clouted cream)* and poured into the paper well. If the article to be copied contains much work, with many fine lines, it is well to pour on a small quantity of the plaster first and urge it into the cavities with a brush, afterwards adding plaster enough to give the thickness required. A very beautiful effect is sometimes obtained by taking a first thin cast of the relieved parts, in plaster which has been mixed with some coloured water, as blue, red, green, &c., subsequently adding the pure white plaster to form the table and substance of the medallion. Of course the converse method may also be adopted, giving a white profile on a coloured table.

The foregoing operations relate entirely to comparatively flat objects, which are by far the most manageable and may be executed with an ordinary share of dexterity: but when the objects consist of busts, figures, &c., in bas-relief, the manipulation becomes more difficult. In that case a different course must be adopted, and various contingencies provided for, requiring a degree of skill only to be acquired by practice, and not to be communicated in any printed directions. In some instances, by filling up the under-cuttings with wax or tallow, a mould may be taken in the manner before stated, in a single piece; the under-cuttings being afterwards worked out by proper tools, in each casting. Other subjects may render it necessary to form the mould of plaster and divide it into two, three, or a greater number of pieces.

About eight or ten years ago, an ingenious Italian artist exhibited and taught a method of making *elastic moulds*, by means of which he produced some of the most beautiful plaster castings I ever saw, many of them from subjects of more than ordinary difficulty. One was a hand grasping an orange—another a bunch of filberts—from a single mould; but his *chef d'œuvre* was a clenched hand holding a live eel, the convolutions of which, issuing from between the fingers, formed a series of loops that seemed to defy all attempts to perpetuate their appearance by casting. Serpents, lizards, and other small animals upon slabs, may be copied by single moulds of this description very easily; while many bas-reliefs that would require plaster moulds to be divided into a great number of pieces, may, by means of the elastic moulds, be accomplished with two or three divisions.

To make these moulds, take one part (by weight) of the best glue and two parts of treacle; the glue having been softened in water, is to be melted and the treacle added to it. These ingredients should be intimately incorporated together, which is best accomplished by pouring the composition into a tray to cool, and afterwards cutting it up and remelting it, care being taken to avoid using too much heat. An ordinary glue-pot is a convenient vessel for this purpose.

If the thing to be copied is upon a base, it is to be surrounded with a frame of wood, paper, clay, or other similar material, and carefully oiled; the glue

composition is then to be poured into the frame, quite warm. If a figure or bust is to be copied entire, it must be suspended by threads within a box or frame, so as to be surrounded by the composition. When set, if the original cannot be withdrawn without, the mould must be divided with a thin sharp knife, or by means of threads previously laid in a suitable posture upon the model. If the original can be extracted without dividing the mould, any number of plaster casts may be withdrawn in the same way. For immediate use, the treacle may be dispensed with, but the glue alone is decidedly inferior to the composition. These moulds may be used for casting wax as well as plaster, provided the wax is not poured in too hot. Plaster moulds, if used for wax casting, should be well saturated with water, to prevent adhesion. To harden plaster moulds, previous to casting plaster in them, take half a pint of boiled linseed oil, one ounce of oil of turpentine, and brush the mixture over the plaster repeatedly till it will absorb no more; then put the mould by for a day or two, when it will become very hard with a good surface, and may be used as before directed.

With respect to the means of hardening the plaster in casting, alum-water is said to have this effect, but I have never tried it. It is necessary to use the finest and *freshest* plaster—to mix it smoothly and free from air-bubbles, when the most delicate impressions may be obtained, leaving nothing to be desired on that head. The effects obtained by the stereotype process especially in copying the finest wood engravings, show how perfectly good plaster will copy the finest lines.

A casting being once obtained, possessed of the desired accuracy, it may be subsequently hardened and rendered durable in several ways; one is, to give it several coats of isinglass, parchment, or other fine size, and when it bears up, a finishing coat of copal varnish.

It has been proposed by Sir John Robison, secretary of the Royal Society of Edinburgh, to take casts of the smaller animals in plaster by means of the elastic moulds, and therefrom by Mr. Spencer's Electrotype process, metallic counterparts, for the purposes of ornamenting silver and plated goods; in lieu of the distorted and unnatural figures, now too often introduced for want of better. In this respect, the discovery of our countryman, Mr. Spencer, seems most opportunely to supply our artisans with a ready means of keeping pace in their productions with the improved and improving taste of the age. What may be the value of this discovery, or what the extent of its usefulness, it is at present impossible to say. They are both immense, but *how* immense, future generations only can determine.

I am, Sir, yours respectfully,

WM. BADDELEY.

London, November 30, 1840.

CONDENSATION BY SURFACE REFRIGERATION AND BY INJECTION.

SIR,—In Mr. Fox's communication in No. 898, touching the relative merits of condensation of steam by surface, or by the reinjection of cooled water, it is stated that in Mr. Hall's method, an engine of 200 horse power *only* requires 13 gallons of water, converted into steam per minute, that is 125 cubic feet of water per hour; while in Symington's or Howard's method of condensation in an engine of similar power, 1213 gallons would be required to be cooled per minute for reinjection.

Mr. Hall, in a published statement, allows 60,000 cubic inches of steam = 34.65 cubic feet per horse power per minute, equivalent to 248 cubic feet of water per hour for a 200 horse power engine.

It is just possible that Mr. Fox in his calculations may have omitted the fact that two engines are commonly employed in steam boats.

"Scalpel" does not seem to have examined how far these figures, which he has admitted into his letter, coincide with his subsequent assertion that, "in both cases the same quantity of caloric has to be taken from the same quantity of steam." Judging, however, from Mr. Fox's expressions respecting the impossibility of cooling 1213 gallons in comparison with 13 gallons of water contained in steam, that he may have a temperature blunder in reserve, I conceive the common proof of "Scalpel's" assertion may be adverted to with propriety. Now the latent heat of atmospheric steam is about 970°. The temperature, or sensible heat in the present case is the difference between 100° and 212° = 112° making together 1082° absolute heat to be extracted from each gallon of water contained in the steam; but this amount requires multiplication by 13 gallons, and the common equivalent expression is 14066 gallons reduced 1° of temperature.

The difference of the temperature of the injection and hot well water may be taken at 40°; then $\frac{1082}{40} = 27$ times as much injection water, as the water in the steam to be condensed. If the difference is taken at 30° then $\frac{1082}{30} = 36$ times.

This amounts to 351 and 468 gallons respectively for the condensation of 13 gallons of steam water per minute, and consequently the equivalent is 14.040 gallons reduced 1° of temperature (the difference arises from the omission of fractions). So much for theory. In the only practical investigation that ever came to my knowledge of the amount of injection used in a land engine as compared with the boiler supply, the actual amount of injection exceeded the calculated quantity by one-ninth. Mr. Fox seems to have allowed 1213 for 200 horse power, instead of 702 for 40° and 936 for 30° difference in the injection water and hot well, amounting to an enormous excess; this, however, may be in some degree accounted for by common practice in marine engines, which are often worked much beyond their nominal power. Engineers also are apt to supply the *fashionable* demand for a very perfect vacuum by the simple means of an extravagant amount of injection water, and moreover steam from sea water seems to require more injection than that produced from distilled water. In comparative cases of this nature the exact theoretical quantities of heat to be abstracted from water contained in steam producing the same power, must be used—until such time, at least, as correct practical data can be supplied.

The advantage of Howard's and Symington's method of cooling injection water, instead of the steam, it seems to me, will depend on the time, which can be allowed instead of the instantaneous action necessary in Hall's plan, and I concur most heartily in "Scalpel's" views, as soon as practice shall have determined the requisite area of pipe surface.

Having formerly made some calculations relating to Howard's method of condensation by the reinjection of cooled water, in a case where the *cooling water* was of an appreciable money value, no doubt remains on my mind that this plan, and consequently the simpler scheme of Symington, are both well adapted for marine engines.

Your's faithfully,

S.

December 7, 1840.

MR. SYMINGTON'S SYSTEM OF CONDENSATION.

Sir,—When, in replying to Mr. Fox's letter in No. 898, of your Magazine, I stated that I had no wish to say a single word against Mr. Hall's invention, and would not allow myself to be dragged into any controversy on the merits of our respective systems. I may add—nor will I take part in a controversy which, in my opinion, is neither edifying or useful.

Before taking leave of this subject, however, allow me to make a remark or two. "Honestometer," who calls himself a "fellow labourer in the vineyard," with Mr. Fox, seems much puzzled to know how it is possible to cool 1200 gallons of water by my plan. Far be it from me to say this is weakness of comprehension on his part; on the contrary, I am sure that had "Honestometer" applied the "desirable brush" to his own eyes as well as he has to those of your readers, he would have discovered that it is quite possible to cool double that quantity if needed. I must admit, indeed, it is enough to stagger some of Mr. Fox's hearers to be told so much was done with the *City of Londonderry's* engines, and that too (according to Mr. Fox's own showing) with "even less surface than that applied to the ten-horse power engine at the bleaching concern."

In conclusion, I have no ill-feeling towards Messrs. Fox and "Honestometer," but wish them every success. Seeing they have taken to "a vineyard," their labours may be expected to be fruitful; however they must bear in mind not to call out "sour grapes," should they happen to hang beyond the reach of the Fox.

I am, Sir,

Your most obedient servant,

WM. SYMINGTON.

Wangye House, Essex,
December 10, 1840.

ON THE VARIOUS PLANS PROPOSED FOR PRODUCING UNIFORMITY OF RATE IN THE PERFORMANCE OF MARINE STEAM-ENGINES.

Sir,—It would seem, from the many efforts which have of late been made, to effect an equalization, at all times, of the load upon, to the power of, marine steam-engines, that such an equalization is an object which it would be very desirable to attain. Having made myself, in some measure, acquainted with many of the plans for the purpose, and given them some consideration, I am induced to think that the following observations may not be altogether unworthy the attention of those of your readers who have not specifically directed their attention to the subject; and, under this impression, I make bold to transmit these remarks to you, for publication in your valuable periodical, if you should deem them worthy of such distinction.

The importance of a uniform rate of working for the steam-engine, is so plainly appa-

rent in the many accomplished contrivances of Watt for the purpose, that it does not seem to me at all necessary to make, on this point, more than the passing observation, that I take it for granted, that a steam-engine, whether land or marine, will most economically perform the work allotted to it, when it uniformly makes a certain number of strokes per minute. In a land-engine uniformity of speed is attainable by many contrivances which are totally inadmissable in the case of a marine-engine; nevertheless, this engine, under common circumstances, is not less liable to inequalities, in the load upon it, than a land-engine.

Marine-engines, to perform at a uniform rate, when the vessel to which they belong is fully laden, require that the paddle-wheels, which are to be driven by them, should be immersed to such a degree, that the resistance of the water to the passage of the paddles may be just sufficient to restrain the action of the engines to the proper number of strokes per minute. Now, if no variation in the quantity of the cargo of a steam-vessel took place, or if no change in the nature of the impediments to the progress of the vessel was effected, by varying winds and states of the sea, it would be clear that uniformity of motion of the engines, once obtained, would operate continually. But, it is evident, that variations of the kind just mentioned, must have place, and particularly in respect of the cargo, when it is considered that a large part of this is in vessels which make any great length of voyage, composed of fuel which is continually lessened by the consumption of the engines. It follows, from any dimunition of the quantity of fuel that the vessel will become lighter, will therefore be less immersed, will likewise have the wheels less immersed; and, as the curve of immersion of these is less, the paddles of them will meet with less resistance, in consequence of there being a less quantity of paddle-board immersed at any one time: the resistance of the water to the paddles being less, the load upon the engines will also be less, and these will make more than the proper number of strokes per minute, or make the proper number with less effect. A little consideration will suffice to prove that, in respect of the cargo alone, it is utterly impossible with the common wheel to attain uniformity of motion in the engines. Variations, in the force and direction of the wind, and in the smoothness and roughness of the water, will be also found, upon reflection, to be capable of preventing the desired uniformity of action from being attained. Some contrivance, therefore, is indispensable, if we would attain that rate of speed for the engines which experience has proved to be highly useful. Various plans, which have at different times been proposed with this purpose in view, it is now my intention to describe, in the chronological order, as far as my knowledge goes, of their publication.

The simplest and rudest method was that of using the paddles rigidly fixed by bolts to the spokes or arms of the paddle-wheel, and shifting them whenever the rate of working of the engines had become too great. It is clear that such a process would always be tedious and sometimes dangerous, and, from the long intervals at which it could only be practically performed, the desired effect could only be attained in a very imperfect manner.

A process was brought before the Society of Arts, many years since, by Mr. Jonathan Dickson, and consisted of a method of lowering and raising the paddle-wheels by means of a peculiar apparatus which is described at length, in vol. 2 of the New Series of the Register of Arts; by which plan each paddle-wheel was made to perform a part of a revolution round the main shaft of the engines, this shaft being fitted with a toothed wheel, which worked into another toothed wheel fixed to the end of the paddle-wheel shaft, which last shaft was therefore necessarily distinct from the main shaft of the engines. Such an apparatus would effectually answer the purpose for which it was designed; but objections to its use arise in the nature of the machinery required to effect the purpose, and in the want of fixedness of so large and weighty an apparatus as a paddle-wheel; and another objection exists in the circumstance of the apparatus by which the purpose is attained, being continually in action. The engine in this plan does not, as in the common method, at once turn the paddle-wheel, but transmitting its power by means of the toothed wheel at the extremity of the crank shaft to the toothed wheel upon the paddle-wheel shaft, turns this shaft, and, with it, the wheel. There is therefore required in this plan one bearing more for each wheel than in the ordinary method; from which there necessarily arises some friction, to which may also be added another amount of friction, arising from the transmission of the power from the main shaft to the paddle-wheel shaft, by the intervening toothed wheels.

I propose now to notice a plan of effecting the end in view, by a means, which if it has ever been considered capable of attaining it, at least is not generally so. The plan consists of a paddle-wheel, the paddles of which enter and leave the water edgeways, and it is commonly known under the name of Morgan's wheel, though it was originally invented by Mr. Elijah Galloway, and was secured to that gentleman under letters-patent, dated the 2nd July 1829, but having since passed into the hands of Mr. Morgan, and been

subsequently improved by the latter gentleman, it is now better known by the name of its present owner than by that of its original inventor. Those of your readers who may not be acquainted with the plan, I beg to refer to No. 598 of your Magazine, in which will be found a full description and illustrations of it. This method has been extensively used in the Government Steam Marine, and has been found to possess the advantageous effects of better employing power than the common paddle-wheel, and in preventing the violent shocks to the machinery, and the vibration to the vessel, which so disagreeably wait upon the employment of the latter instrument; but, from a defective construction of its framing, and from some of the working points being always immersed in the sea-water, and becoming corroded by its action, the continual and expensive repairs consequent upon these circumstances, have been so great, I have been informed, as to have caused it in many cases to have been discarded from use. Of course, if these objections were not capable of removal, this method must naturally expect to receive its doom; but I shall presently speak of a plan which does propose to entirely obviate these objections. My present object is, however, to show that this wheel is almost perfectly capable of effecting an equalization, at all times, of the load to the power of the engines.

Those who have considered the form of curve which a paddle, of the wheel under consideration, makes when it is passing round the centre of the wheel to which it belongs, will appreciate that the paddle, during a large part of its path, both before it enters and after it leaves the water, passes with its edge only, as far as regards all practical objects, opposed to the water; and that, consequently, if the wheel were immersed to such an extent, as to immerse the paddles during these portions of their paths, the paddles, which thus presented their edges only to the water, would be no more resisted than if they were out of the water altogether, now, if a wheel of this kind was so used that, while the paddles were passing through the parts of the curve, which are between the heavy load and light load water-lines of the vessel, they should present only their edges to the water, it is clear that the paddles, during these parts of their passage, would meet with no resistance, and, consequently, as regards the curve of immersion of the paddles, these, (the paddles,) would be entirely unaffected by any varying immersion of the vessel.

It is very common to talk of a denser sort of water at different depths, but a proper acquaintance with the nature of water must at once show that, though mathematically speaking there is a greater density at a greater than at a less depth, yet, to produce a very slight increase of density, it requires the pressure of an enormous force, or that the depth of the water should be exceedingly great—circumstances which do not obtain in the case under consideration. Nevertheless, from the greater quantity of water, above any water to be displaced by a paddle, there evidently results what is almost tantamount to a denser medium, when the velocity of the paddle is great. Now, though this must always operate, and it is an advantage belonging to this wheel, which does not appear to have been properly considered and turned to use, it will not be of so great an amount, as to prevent this wheel from being equally competent to attain the desired equalization of load, with even the best of all the others. With this wheel, the curve of resistance to the paddle will always, whatever the probable immersion of the wheel, be pretty closely the same, and, by the size of the wheel never being lessened, or its rate of revolution never being much retarded, there is greater possibility of the speed of the vessel being pretty equally maintained at all times. Add to this the absence of all adjusting machinery, and it does not appear too much to ask a little allowance, on the score of frictional wear, upon some of the working points of the wheel. The peculiar property of this wheel is, that it gives practically the utmost possible effective return to any amount of power employed upon it, as will become evident to any one, who will take upon himself the trouble of inquiring scientifically into the subject. It, besides, is capable of equally giving this beneficial return to power when working at great, as at little depths; though, when made to work at greater depths, there results the advantage of using larger wheels under the same sized paddle-boxes, as respects the diameter of these boxes, in consequence of the machinery being capable of being placed much lower in the vessel; there would also arise greater steadiness in the vessel from the machinery being brought lower; and, from the greater velocity and greater depth at which the paddles of this wheel might work, either a considerably narrower paddle-wheel could be required, or a less number of paddles to the wheels might be used: besides, it is not of importance, in this plan, to have the very great number of paddles which is employed with the common wheel, inasmuch, as with this wheel, it is of little consequence whether large or small paddles be used, because each paddle, whether large or small, from the peculiar action of the wheel, enters its path of working edgeways, and, practically, acts like a paddle, which expands from a line equivalent to its edge, into one equal in size

to its whole surface—in fact, every paddle acts upon the engine with the gradually increasing and decreasing pressure of a spring. I have been rather surprised that, in trying this plan in the river, it should have been thought proper to use it nearly under the same circumstances as the common paddle-wheel; that is, with only a slight degree of immersion, inasmuch as the advantages of this plan can never be brought out, except under those circumstances, in which its superiority is undeniable over the common wheel. If it had been employed in the most effective manner, we should, I think, have seen narrower wheels, less spray, and less crankness in our fast river boats, than have obtained.

With a view to obviate the disadvantages arising from the weakness in the framing of the last plan, the author of these remarks brought forward another solution, of the problem upon which the last wheel is constructed, which admitted of the application of a framing, equally strong with that of the common paddle-wheel, and which allowed of great decrease in the cost of construction, and prevented all that wear upon the working points, which arises in the last plan from a yielding of every part of the framing. This plan is illustrated and described in No. 800 of your Magazine, to which I must refer such of your readers as may be desirous of acquaintance with the method. It was secured under letters patent, dated 27th February 1838, with other plans, some of which will next be noticed. Since the patent was specified, the author has turned his attention towards a means of obviating the action of the sea-water upon the working points of the wheel, which are necessarily immersed in the water; and he has been successful enough to attain two plans of effecting the end he had in view.

From some similarity in parts of this wheel, it was at first thought to be only a variation of the plan which came under the right of the owner of the wheel last described; but an attentive examination of this wheel, and an acquaintance with the extent of Mr. Morgan's claim, and what was previously done before the date of the patent which Mr. Morgan holds, it will clearly appear that this plan does not trench upon the patent of the gentleman just mentioned; and, if any thing were wanting to disestablish all identity, it would be found, first, in the circumstance that the geometrical process, by which the position of the eccentric centre is found in Mr. Morgan's wheel, is totally inapplicable and useless in the case of this wheel; and, secondly, in the condition, that every working point, in the two combinations, is in as opposite and different relative positions as possible: in fact, no one of the working points, except the centres of the paddles and the centre of the paddle-wheel shaft is in any thing like the same position in the two wheels: and, it is scarcely necessary to observe, that the similarity of position of these points in the two wheels, can give no colour to identity of plan between the two methods; because, in all wheels having moveable paddles, the positions of such points must ever be the same.

The next plan to be noticed was also brought forward by the author of these remarks, under the patent before mentioned, and by this it was proposed to use the framing of a common wheel, but to fit it up with an apparatus for moving the paddles, upon the spokes of the wheel, from or towards the centre of it: by which plan, whenever the vessel became lighter or heavier, the curve of immersion of the paddles was increased or decreased to such a degree, as to equalize the resistance of the water to the paddles; and, by this means, the load to the power of the engines. A vessel, fitted with wheels of this kind, would, at the period of her departure from a port, have the diameter of her wheels of the smallest necessary measure, and, as the vessel became lighter and lighter, from the consumption of fuel, the wheels would be essentially made larger and larger, by the paddles being thrust further and further from the centres of the wheels. The apparatus, designed for the purpose, of effecting this difference in the diameter of the wheels, was at once strong and effective, and the desired effect could even be produced by it, while the vessel was in motion; though it would never be necessary or desirable to produce the effect under such circumstances. Some persons have thought that this wheel must be rendered so much smaller, at the commencement of a voyage, that the effect, from an increased number of strokes of the engines, would be counterbalanced by the result attendant upon the diminution of the diameter of the wheel: in other words, that, though the engines made more strokes, the paddles would not travel faster. To explain this idea more clearly, I will suppose that, with wheels of 20 feet diameter, the immersion of a vessel and its wheels is so great, that engines, which should make 20 double strokes per minute, make only 17 such strokes. Under such circumstances, the speed of the circumferential parts of the wheel would be 20, multiplied by the proportion of the circumference to the diameter, or 3·14, and the product again multiplied by the number of strokes per minute, or 17; which process would give 1067.6 feet per minute. Now the persons before mentioned imagined that the diameter of the wheel must be decreased, in exactly the same proportion as the number of strokes of the en-

gine was increased; or that, in order to enable the engines to make 20 double strokes per minute, it would be necessary to reduce the diameter of the wheel to 17 feet; in which case, by multiplying this new diameter by 3·14, and this again by 20, or the number of strokes, we should have a speed of the paddles of 1067·6 feet per minute, or exactly the same as when the engines made only 17 strokes per minute. Were these persons right in their conclusions, the plan under consideration, whatever attempts might be made to bolster it up, would, and must, deservedly fall to the ground; because, it is evident, that by adopting this method, we should, under such circumstances, be employing machinery, the ultimate end of the use of which would be, to produce, from 20 cylinders twice filled with steam, precisely the same effect, as with the common wheel, we could produce from only 17 cylinders twice filled with steam; which is as much as to say, that, with a greater expenditure of fuel, we could produce only the same effect as with a less expenditure—clearly no very flattering recommendation of the plan. But independently of many considerations, into which it is not necessary now to enter, such a result could never wait upon this plan, as will be seen from the following imagined case, by which, it will be perceived, that the curve of immersion of the paddles diminishes, in a much greater proportion, than the diameter of the wheel. To explain this, let us suppose that, when a vessel is fully laden, the resistance against the paddles is such, that the wheels, which ought to make 20 revolutions per minute, make only 17. Let us suppose further that the wheels are 20 feet in diameter, and that they are immersed to the extent of 1½ foot of their radius. Now, if the persons before mentioned were correct in their ideas, it would be necessary, in order to produce 20 revolutions of the wheels per minute, to diminish the circular path of the paddles to a diameter of 17 feet. But what would result under such circumstances? Why, such a diminution, in the path of the paddles, would clearly take them out of the water altogether, and the engines would be without any load at all upon them; and, in order to produce the requisite load, it would be necessary to enlarge the circumference of the path of the paddles, until the desired number of revolutions of the wheels or double strokes of the engines was obtained; which, from what has just been said, it is clear would cause the circular path of the paddles to be of considerably greater diameter than 17 feet, and not very greatly inferior to the original diameter of 20 feet.

Even under such circumstances, it must not be imagined, that the vessel would go as fast as it would if the wheels made 20 revolutions, when they were of 20 feet diameter; because, it is clear, that though the full power of the engines might be brought out, the resistance to the passage of the vessel would be greater, in one case than in the other, from the greater increased sectional area of it. But, from the nearer approach in speed of the paddles to the full speed of these, we might expect to obtain a greater rate of speed for the vessel, than if the paddles travelled through a space represented by a circle of only 17 feet in diameter, or diminished in the proportion of 17 to 20: for, I think it will be allowed, that, with wheels, travelling at the lesser rate, we could not hope to attain the speed that we could, if these travelled at the greater rate. There must always be maintained some differing proportion, between the speed of the vessel and the speed of the paddles, and though we might expect to attain a speed of 10 miles an hour for a vessel, when the wheels of it were travelling at the rate of 15 miles an hour, we could hardly expect to maintain the same rate of speed for the vessel, when the wheels were travelling at the rate of only 10 miles an hour; for, if we could obtain this speed, under these altered circumstances, we should have the vessel travelling at the same rate as the wheels. It is clear, that, without taking other circumstances into consideration, the wheels could not, under such conditions, be exerting any propelling power, and we should find the vessel fall off in speed, until there existed, such a difference, in the rate of speed of it and the wheels, as should be capable of keeping the vessel at a uniform rate of motion, which would be considerably under the rate of 10 miles an hour.

From what has just been stated, it appears to be desirable to keep the path of the paddles continually as near their greatest path as possible; for, while this is maintained, we may expect to obtain the greatest speed for the vessel, and, it has been seen, that the plan under discussion does in a very great degree effect this desirable end; for it has been shown that the path of the paddles, is not diminished in near the same proportion as the resistance of the water to the passage of them. But, it may be seen, that this method does not attain the utmost possible approach to the greatest speed of the paddles which is so desirable; and I shall now show another plan, more capable of attaining this end, also by the author of this paper, and described in the specification of the patent before mentioned.

By the last method it was proposed to accommodate the diameter of the path of the paddles to the varying immersion of the wheels; but, by the plan about to be described, it was intended that the path of one portion of the paddles should be con-

stant, while the variation, in the resistance, should be obtained by enlarging or lessening the surface of the paddle-boards; or, in other words, by reefing the paddles of the wheels. In this method a certain quantity of paddle was proposed to be fixed permanently, at the extremities of the arms of the wheel; which quantity was never to be greater than the engines could drive at their proper speed, under the most unfavourable circumstances; and, in order to adjust the resistance of the water to the power of the engines, it was proposed, by means of machinery of the same kind as that used in the plan last mentioned, to draw out, from behind the fixed portions of the paddles, other moveable portions, so that as the vessel became less immersed, the quantity of paddle-surface resisted by the water should be increased. The process to be pursued, under this plan, would be, when a vessel was fully laden, to shroud all the moveable paddles behind the fixed ones, and, as the vessel became lighter and the resistance against the fixed paddles became less, to draw the moveable paddles, gradually beyond the fixed paddles, towards the centre of the wheel; in which case, as the curve of immersion of the paddles continually become less, the quantity of paddle-surface would continually become greater, until the whole of the moveable paddles were unshrouded; at which time, it is assumed, the vessel would have acquired her least degree of immersion, as far as her cargo of fuel was concerned. From a consideration of this plan, it appears that the path of the fixed paddles is unvarying in speed, though it is true the path of the moveable ones is of different lengths; but as the total rate of speed of the paddles clearly approaches nearer in this plan than in the one previously discussed, to the utmost possible rate of speed attainable, if the paddles were used continually at the utmost distance from the shaft that the wheels would allow, so we may hope to obtain with this plan, agreeably to what has been before stated, a greater speed for the vessel than we could hope to get with the former plan. Besides, as regards the means of using the machinery necessary to produce the equalization of resistance, this plan has some advantage over the other, as regards the prevention of the corrosive action of the sea-water upon the arms or spokes of the paddle-wheels. It may be remarked, that the machinery requisite to this plan, though not so simple, as experience has since shown, it might have been, was perfectly capable of effecting the object in view; and, unlike that of some of the methods which are mentioned in these observations, was never in action, except for the short time during which the adjustment was made, being at all other times perfectly at rest, and incapable, by friction or otherwise, of diminishing the power of the engines. The objections which may be urged against the last two plans are, that the requisite apparatus would add considerably to the first expense as regards a common wheel, and that there might arise some wear from the action of the sea-water upon a few exposed parts of the apparatus. The last objection may now be entirely obviated by the adoption of plans proposed for this purpose by the author of these remarks. Such of your readers as may require a description of the last two plans, I must refer to No. 812 of your Magazine.

The next plan proposed for the attainment of the desired equalization of the load to the engines, is altogether different from any of the preceding, and the object is effected without any alteration in the path of the paddles, this being attained entirely within the vessel. It is described in the specification of a patent, granted to Messrs. Maudsley and Field, on the 7th of May, 1839; a detail of the objects of which is contained in No. 30 of the *Civil Engineer and Architects' Journal*. In this method it is proposed, by the employment of larger or more numerous cylinders to the engines, to attain an equable rate of speed for the engines at all times, by means of using steam of different density at different times; at times when the vessel is deeply laden, steam of the ordinary pressure is proposed to be used, the cylinders being of such a size that such steam will be capable of driving the wheels, and, of course, making the engines work at a proper rate. At other times, when the vessel becomes lighter, and the resistance of the water to the paddles less, steam of less density is intended to be employed; so that in this way the engines and the wheels will always work at a uniform rate. But this plan is not without its objections, as will now be seen.

The employment of larger or more numerous cylinders to be filled with steam of the full pressure, under adverse circumstances, such as when the vessel is fully laden, or exposed to the action of strong head winds or a heavy sea, infers the accompaniment of larger boilers, and all the concomitants of larger and heavier engines; and all this, it should be remembered, for use only under adverse circumstances. Now, as the adverse operation of the lading of a vessel, as far as this is dependant upon fuel, is greatest when the vessel first sets out, and lessens gradually day by day; and as any objection upon the score of head winds and heavy seas can be but of partial occurrence, it may be worth while to hesitate before employing machinery truly powerful enough for the worst occasions, but at all other times acting as an incumbrance in taking up space,

and loading the vessel unnecessarily; and these objections become more important when we consider how small, comparatively speaking, and how valuable, is the space which is left for freight in even the largest steam vessels. It should, however, be observed, that this plan comes accompanied, in the patent, with improvements calculated to save space and weight, and even with the more cumbrous parts just mentioned, the space taken up in the vessel is less than is taken up under ordinary circumstances; but it perhaps might have been as well to have made the improvements which save space and weight, without attaching to them others having precisely a contrary effect. The plan, however, with these objections, is perfectly competent to attain the end proposed, is capable of nice adjustment, and acts entirely within the vessel.

The next plan to which I come, is that of Mr. Samuel Hall, secured under letters-patent, dated 7th October, 1839. A description of this plan, together with an able comparison of it with one of the plans by the author of these remarks already described, is given in No. 874 of this Magazine. Concurring exactly in the observations therein made, I shall only remark of this method, that all that has been said of the second before-mentioned plan of the author of this paper, is equally true of this one; while it may, in addition, be remarked of this, that some of the machinery, by which the end is obtained, is more simple and less costly of manufacture.

We next come to a plan by Mr. George Rennie, included in the specification of letters patent, granted the 26th November, 1839, and described in No. 879 of this Magazine; by which it was thought that, with double and single immersions of a paddle-wheel fitted with trapezium-shaped paddles, the resistance of the water, to the passage of the paddles, would be almost exactly the same. Now, without at all intending to impugn the accuracy of the particular experiments relied on to establish this important property, for such shaped paddles, I must be allowed to doubt the possibility of such results being, in general, obtained with wheels thus fitted. But as an investigation of this subject would take up more space than perhaps would be desirable, I shall say no more than that, to my mind, this plan is incapable of producing the desired effect.

Another plan was described in the Civil Engineer and Architects' Journal for March, 1840, as applied by Boulton, Watt & Co., many years since, to a vessel on the Tyne. This consists of a paddle-wheel, the floats of which are moveable, by very simple, and at the same time, very rudely and incorrectly working machinery, towards or from the centre of the wheel. The construction of this wheel is such, that there is a tendency to jam in almost every part of it, and it could only have worked at all, by unadviseable allowances being made, in order to obviate the ill effects of this tendency.

The next method to which we come is one by Mr. Samuel Seaward, secured under letters-patent, dated 17th March. 1840, for this as well as other improvements. The plan is described in No. 894 of this Magazine, and consists of a method of equalizing the resistance of the water to the paddles, to the power of the engines, by making the wheels sometimes move faster, and, at other times more slowly. Unquestionably this is an ingenious mode of attaining an equable rate of working for the engines, particularly as the machinery for effecting it is contained within the vessel, and is secure from all action of the sea water upon it; but it is not altogether free from important inherent defects. We have here two extra bearings for each paddle-wheel shaft, one on the side of the vessel, and another on the main frame of the engine; these extra bearings, it is clear, must be attended with some loss on the way of friction, and there will also be some loss on this account, in the transmission of the power from one toothed wheel to the other; and it should be recollected that this friction is constant, the equalizing apparatus being continually in action. But an important point, which appears not to have been duly considered, consists in the expectation that, when the paddles revolve with the lower rates of motion, something near the same speed for the vessel will be obtained, as when they revolve at the highest rate: I think this expectation is not warranted. For, suppose, when the wheels make 20 revolutions per minute, the circumferential speed of the wheels is 15 miles an hour, and the speed of the vessel one-third less, or 10 miles an hour. Now, if the speed of the wheels should be reduced to 17 revolutions, the speed of the vessel would be, if the same proportion, between the speed of the wheels and the speed of the vessel, were preserved, only (20 : 10 : : 17 :) 8½ miles per hour; and if the speed of the wheels should be further reduced to 14 revolutions, and the same proportion maintained between the speed of the wheels and the vessel, then the speed of the vessel would be reduced to (20 : 10 : : 14 :) 7 miles an hour, which is no very great speed. I must not, however, be here understood to assert that the same relation would exist between the speed of a vessel and the speed of its wheels, however much the rate of the wheels might be reduced; but it is quite clear, that unless the rate of the vessel is diminished in some pro-

provision on the part of man. The proportion, as the rate of the wheels is diminished, we should find, under certain degrees of diminution of the rate of the wheels, that the vessel would be travelling as fast as, and even faster, than its wheels—evidently impossible occurrences. I do not mean to say that no portion, of the useful effect desired, will be obtained by this plan; but that not near so much will be, as may be expected from a first view of the plan, or as might be by some other methods mentioned in these remarks. It appears impossible, under this plan, to effect any nicety of adjustment; because, to do this, would necessarily require more toothed wheels than it might be convenient to use: practically, however, perhaps the three adjustments, set down in the description of the plan, would be all that would be generally necessary.

Another plan by Mr. Wilson, was described in No. 869 of the Magazine, which consisted of an expanding and contracting paddle-wheel. Of this method, the same observations may be made that have been before adduced in respect of other wheels of the kind; but, specifically of this plan it may be remarked that, there is a great tendency in some of its parts to jam; and, during a part of the contraction, a great disposition to rend some of the parts asunder, rather than to effect the contraction of the wheel.

In the same number of the Magazine, another wheel of the kind is described, invented by Mr. Oxley. The same observavations generally apply to this as to all other wheels of the sort; but of this, it may be particularly observed that, the complexity of the contrivance is such, as to preclude all idea of the adoption of it.

And now, Sir, having, as I think, fairly set forth the plans which have been brought forward to attain the end desired, I shall conclude my remarks, by offering every apology for this long trespass upon your valuable space, and by subscribing myself,

Sir, your most obedient servant,

J. P. Holebrook.

168, Devonshire Place, Edgeware Road, October 2, 1840.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

William Bush, Camberwell, Merchant, *for improvements in fire-arms and in cartridges.*—Enrolment Office, November 20, 1840.

These improvements relate to the construction of guns, &c., which are to be loaded at the breech, in connection with a peculiar construction of cartridge.

The barrel of the gun or musket has a slit or opening at the hinder part to receive the apparatus forming the breech; at the end of which slit or opening two pieces are brazed on, each having a hole through which a screw passes, forming a fulcrum for the breech, which moves backward and forward, into or out of the end of the barrel by means of a lever connected to it by a parallel motion. The hammer and springs are placed within the stock, the discharging trigger projecting below within the trigger-guard as usual.

At the end of the breech there is a hole, closed by a hollow shear steel screw filled up with pewter through which the touch hole is drilled. The object of this is to avoid oxidation, and to obtain elasticity so as to fill up any cavity made by the fitting of the discharging needle, or by the sliding of the breech. The discharging needle lays just within the hole in the compound screw and opposite to the hammer of the lock.

The hammer is raised by means of an external lever connected with a crank; on pulling the trigger the hammer strikes upon the needle driving it forward into the centre of the cartridge where it ignites the percussion powder and fires the charge. The construction of sporting guns and muskets according to the said improvements, is clearly set forth in the specification, as also the mode of adapting the same to guns of the present construction.

The cartridge is made by taking a circular disc of wood, or two card-board boxes, like two pill box lids fitted one within the other, having a hole in the centre in which a percussion cap or patch is placed, and held there by being covered with a piece of calico or other similar fabric. Around this as a base, the paper cylinder or case is formed and filled up with the proper charge of gunpowder, and shots or a ball as the case may be.

The claim is, 1. The mode of constructing the hinder ends of the barrels of fire-arms, in combination with the means of constructing and moving the breech, 2. The mode of constructing cartridges and applying percussion powder to the interior of the cartridge and at the back of the charge of gunpowder.

Christopher Dain, Edgbaston, Warwick, Gentleman, *for certain improvements in the construction of vessels for containing or supplying ink and other fluids.*—Enrolment Office, Nov. 30, 1840.

What are here styled "*improvements*," would be more properly described as "additions to" fountain inkstands. When man attempts to improve upon the works of nature, he generally misses his mark; the fountain inkstand, it is well known, maintains a uniform level of fluid in the dipping cistern, from natural causes, independently of any extraneous help or

sent patentee has attempted to supersede this perfect principle, by a complicated appendage, which we will endeavour to describe to our readers. The body of the inkstand is made spherical, with a prolonged tube or neck issuing from its lower end, and turned up to form a dipping cistern; about the middle of which tube there is a circular opening on its upper surface. This body, which is of glass, is cemented on to a metal slab or stand; a saddle-piece of brass is placed across the neck directly over the opening before described—a short tube rising from which encloses a square brass pillar terminating in a quick threaded screw, having on its lower end a cork of such a size, as to enter the orifice in the glass neck, and close the communication between the ink reservoir and the dipping spout. Within the tube over this opening there is a nut in which the valve-screw rises and falls; the nut is turned by a key fitting on to a square spindle, while the valve screw is prevented from turning by its shaft working through a square guide. A brass stem rises from the saddle piece to the top of the reservoir, where another square headed screw and cork closes an aperture, which is termed the air-valve.

To charge this inkstand, screw down the *ink-valve* so as to shut off the communication with the dipping spout; then open the *air-valve*, through which the ink is to be introduced by means of a funnel which forms part of the requisite appendages; when the reservoir is filled, the air-valve is to be shut. For use, unscrew the air-valve first, then unscrew the cork which forms the ink-valve, and allow the ink to flow into the dipping cistern, but be very careful to shut off the valve the instant the cistern is filled, or the ink will overflow, staining all such matters as presume to impede its progress. We fancy an inkstand constructed agreeably to this specification could never act—and if it did, we know not who would be troubled to use it; there is evidently a vast deal of pains taken to spoil what *was* originally a good inkstand! The claim is, for the introduction of a valve or stopcock placed between a reservoir for the ink or other fluid, and the vessel or cistern from which it is taken to be used, whatever may be the form or construction of the valve or stopcock so employed.

Pierre Dufaur de Montmirail, formerly of London Wall, but now of Panton-square, Haymarket, Gentleman, *for certain improvements in the manufacture of bread.*—Rolls Chapel Office, Dec. 1, 1840.

In the first place instead of using pure water for mixing the dough, the following liquid is made use of;—four ounces of gum arabic are dissolved in eight quarts of boiling water; when the gum is thoroughly dissolved this liquid is run off into a cooler, and left till it is of a blood heat, when it is ready for use. Instead of dissolving the salt in water, as is usually done, it is to be thoroughly dried in the oven (but not burned), and afterwards pulverised as finely as possible, in which state it is to be intimately incorporated with the dry flour, by which means it is said greatly to add to its absorbent power, and to cause the gum water to combine more intimately with it. Bread made with the aforesaid liquid, &c., in the ordinary manner, and baked carefully will (it is said) yield a greater quantity from the same quantity of flour, than when made on the old plan; and will be lighter, more wholesome, and more nutritious. The apparatus described consists of a close boiler set in brick-work in the usual way, and furnished with a safety-valve, filling funnel and cock, and exit cock which runs off the liquid into the cooler, which is a wooden cistern lined with lead and furnished with a stop-cock leading into the kneading trough. The claims are, 1. The use of the liquid or mixture herein before described instead of water for wetting the dough. 2. Mixing the salt in a very dry and minutely pulverised state with the dry flour. 3. The apparatus for preparing the said liquor.

John Hawley, Frith Street, Soho, Watchmaker, *for improvements in pianos and harps.*—Enrolment Office, December 1, 1840.

These improvements consist in the application of tempered steel springs to the above musical instruments, which may be either cylindrical, angular, or quite straight—except for the deep notes, those being thickest in the middle and tapered off toward each end. These wires are to be formed by means of a draw plate having an adjusting screw attached, so as to increase or diminish the pressure at pleasure. The wires are hardened by being heated red hot and quenched in the following mixture, viz. 5 lbs. of tallow; 6 lbs. beef suet; 1 lb. bee's wax; 5 lbs. olive oil; ¼ lb. hartshorn in powder, and 32 grains of mercury. They are then to be tempered by bazing off, or any other convenient method, but the extreme ends of the wires must be let down and made quite soft, to allow them to be wound round the pegs of the instrument without breaking.

The claim is for the application of steel springs to harps and pianos, tempered in the manner described,

Benjamin Winkles, Northampton-street, Islington, Steel and Copper-plate Manufacturer, *for certain improvements in the arrangement and construction of paddle-wheels and water-wheels.* — Rolls' Chapel Office, Dec. 10, 1840.

These improvements are designed, first,

in reference to propelling wheels for navigation, to enable the paddles when in the act of propelling to present their broad surfaces to the resistance of the mass of water; and as the wheel revolves afterwards to fall down and rise out of the water edgeways. Secondly, in reference to the form of water wheels known as breast wheels, to construct the buckets by means of falling flaps, which flaps assume the form of buckets on approaching the horizontal position on the breast side, as the wheel goes round, afterwards gradually collapse as they attain the lowest part of their revolution, and ultimately pass out of the water edgeways. The object in both adaptations being that of preventing any retardation of the rotary action of the wheels by the back water. The mode of accomplishing this object in regard to paddle wheels is shown by four drawings, without which it is difficult to make the arrangements understood. Upon the main shaft is placed the paddle-wheel frame, to the outer rim of which a series of curved paddles are jointed by means of axles, which allow them to turn over freely. The outer edges of these paddles, which are formed in a curve corresponding to that of the rim of the wheel, bear upon its outer edge, against which they are successively thrown by the centrifugal force, or by their own gravity. But, in order to bring them into the proper propelling position, a curved eccentric or snail-formed bar is fixed to the interior of the paddle box, or side of the vessel, and a tail lever extends from the back of each paddle, carrying an anti-friction roller or boss, which, as the wheel goes round, coming in contact with the eccentric guide, brings the paddle into its proper position (radiating from the periphery towards the centre of the wheel), ready to perform the propelling stroke. In order that the paddle may be confined in that position, its inner edge is brought against and firmly held by a spring catch affixed to the inner ring of the framing. When the paddle has passed the lower part of its course and performed its office, a projecting stud on the side of the spring catch comes in contact with an inclined bar, which causes the latch to be raised, and the paddle to be set free so as to fall upon the rim of the wheel, and emerge from the water edgeways. In another modification which is described, the spring catches are dispensed with, in which case the eccentric guide is continued round in front of the wheel, and under the lower part of its course. The boss or anti-friction roller, as the wheel revolves, continues acting upon the eccentric, which keeps the paddle in its proper position until it has passed through the most effective portion of the stroke, when the boss escapes from the eccentric, and falls back into the original position. Means for reversing or backing the paddles are provided, by a modification of the tail lever. In another arrangement the snail-formed bar or eccentric is mounted on an axle at its upper end, the reverse extremity being attached to an upright rod in the engine room, so as to be under the immediate control of the engineer. In this case the tail lever of the paddles is not jointed thereto as in the foregoing plan, but is rigid and forms part of the paddle itself. The paddles are mounted on axles as before, and when it is required to back the vessel, the engineer presses down the rod, and thereby lowers the eccentric, which allows the levers and paddles to pass.

The water mill is of the description known as the breast wheel: upon an axle mounted in suitable bearings a series of arms carry the rim of the wheel, which is furnished on each side with a broad flanch; a number of dished or curved flaps are hinged to the close rim, and play freely between the two flanches, forming a series of buckets. The flanches at their peripheries are braced together by a number of bolts, corresponding with the number of, and forming stops for the bucket flaps to rest upon, while in the active position. After the flaps have passed the vertical position, they fall down upon the stops forming buckets which receive the water from the breast or weir. As the wheel revolves the buckets discharge the water, and hang down by their own gravity, until they approach the ascending side, when they will collapse and fall over on to the rim of the wheel, ready for repeating the operations before described.

WILLIAM LANCE, GEORGE-YARD, LOMBARD-STREET, INSURANCE BROKER, *for a new and improved instrument or apparatus to be used in whale fishery, part or parts of which upon an increased scale are also applicable as a motive power for driving machinery.*—Rolls' Chapel Office, Dec. 11, 1840.

These improvements, which form a good practical commentary on "the art of ingeniously tormenting," consist, in the first place, of certain alterations in and additions to the ordinary harpoon or instrument used in the whale fishery, by which it is forced into the body of the whale as the animal proceeds onward after being struck, thereby securing its capture; and also by an arrangement hereinafter described, causing an explosion calculated to obviate the subsequent process of *lancing* at present required in order to kill the whale, by which means a greater number can be secured in one "lowering down." The second part relates to a mode of throwing such instruments, so as to project them with much more force than can be accomplished by the present method; the advantages of which are, the means of taking more steady aim, and of making fast to the whale at a much greater

distance than by the present method; thus avoiding the liability of having the boat stove or upset by the whale, and enabling the crew to capture a greater number, as it is found in the present practice a matter of much difficulty to get near enough to dart the harpoon by hand. Thirdly, in applying part or parts of the before-mentioned apparatus, on a different scale, to the purposes of a motive power, "whereby a considerable saving may be effected in the expenses of driving machinery"! The instrument or harpoon, which is about four feet long, consists of a spindle having a quick motion screw-thread cut upon its entire length. The head of the harpoon is in two parts; the first part or point is fixed to the spindle, while the other, which forms two barbs, is tapped with a female screw of a corresponding thread to the spindle. The opposite end of the spindle is equipped with four vanes (or a screw or any portion of a screw might be used). After the harpoon has been projected into the whale, and the animal attempts to swim away and make its escape, the resistance of the water acting on the inclined vanes will turn them round, causing the screw to revolve, when the two barbs forming an abutment, the pointed end of the harpoon will be screwed into the whale's body; and in the case of a lady whale it may be said—as of Lucretia of old—"she died by her own hand." To serve the purpose of what is termed a "drogue," a hollow metal ball is attached by a line to the vane end of the harpoon, the natural buoyancy of which considerably impedes the whale's progress. The fly or vanes may be attached to the "drogue," and communicate a rotary motion to it through a line. Another contrivance consists of a kind of harpoon head of a conical shape, being made with triangular cutting edges towards the point, and furnished at its base with barbs or flooks (*flukes*) turning on pivots, which barbs expand the moment any strain comes upon the line to which it is attached, and effectually prevent the instrument from drawing out. In another modification, the instrument is made either with or without the cutting edges, but without any barbs; it is, however, furnished with the following means of effecting an explosion, as soon as it has penetrated comfortably into the body of the whale; there are two arms or levers turning on pivots fixed in the hinder part of the instrument, which are made to diverge upon meeting with any resistance from the body of the whale, as the instrument enters. This motion of the levers causes two jaws on their reverse ends to collapse, and crush a *promethean* upon an enlarged scale, *i. e.* a small glass vessel filled with concentrated sulphuric acid and surrounded with chlorate of potass and lump sugar, the contact of which causes instant ignition and fires a charge of gunpowder, &c. into the body of the fish—occasioning no doubt a pretty considerable sensation in the adjacent regions!

The instrument for projecting these deadly weapons consists of a small swivel air-cannon, having a copper ball or magazine for holding the charge of condensed air, placed beneath the barrel as in the earliest contrivances of this kind: the discharge being effected by screwing down a valve which opens the communication, when the harpoon is projected with the velocity due to the compression of the air. A condensing apparatus for compressing the air into the magazine is shown in detail, but contains no novelty. A break, to be used instead of the ordinary "logger-head" of the whale-boat, consists of a barrel mounted on suitable bearings, having a flanch around it, upon which there rests a metal break terminating in a weighted lever, so loaded as to give as much friction and resistance to the running out of the line as may be deemed safe or expedient.

"The application, upon an increased scale, of part or parts of this apparatus, as a motive power for driving machinery," consists in the use of air highly compressed by the before named means; the air is to be condensed into a vessel of sufficient strength, and supplied to the cylinder for working the piston (as in high-pressure steam-engines) after passing through a coil of tubing immersed in any substance which by the application of heat will increase its elasticity. Or it may be supplied direct from the vessel to the cylinder! This head of the patent has reference also to an application of the fly, or vanes, or screw spoken of, in the water, when their faces being placed at an angle to the plane of their motion will cause them to revolve and thus communicate motion through any arrangement of gear-work to the machinery to be driven. This plan is said to be advantageous for ballast heaving, when the vanes should be placed at the stem of the barge; also extremely serviceable for working the pumps used in condensing the air for the before named purposes, viz. shooting whales, or driving machinery. We should imagine the author of these inventions has the organ of "destructiveness" somewhat largely developed, and it is a singular coincidence that this "cut and thrust" patent (which is a communication) should stand in the name of "Lance." The *power-creating part*, of the patent is absurd in the extreme. The claims are,

1. The apparatus in whole or in part, set forth to be used in the whale fishery—to the precise form of which the patentee does not confine himself.

2. The use of compressed air as the means

of projecting any suitable missile for taking or destroying whales.

3. Effecting an explosion in the body of the whale distinct from the use of rockets.

4. The employment of air highly compressed by the means hereinbefore explained as a motive power.

5. The use of the fans, vanes, or screw, for driving machinery in the way stated.

EZRA JENKS COATES, BREAD-STREET, CHEAPSIDE, MERCHANT, *for certain improvements in propelling canal and other boats.*—Rolls Chapel Office, Dec. 11, 1840.

The method proposed for accomplishing this object, consists in the employment of a parallel endless chain of metal or other suitable substance, furnished with a number of small anchors or catches; this chain passes over large pullies at the stem and stern of the boat, and is allowed to lay upon the bottom of the canal or river; upon rotary motion being communicated to one of the pullies by steam, or other prime mover, from being in direct contact with the chain, it causes the boat to be propelled forward, in consequence of the hold or resistance the endless chain and anchors have upon the bottom of the canal or river. The chain is gradually laid along the bottom of the river by the action of the front pulley as the vessel advances, the pulley at the stern of the boat raising the chain from off the ground. The chain passes over antifriction rollers laid along the top of the boat, to the front pulley, from which it is delivered to the ground as before mentioned. A vessel thus fitted up, is called a steam drag or tug, and is intended to draw a number of boats or barges connected to each other in any convenient manner. The driving or actuating wheel, which is placed in the front of the boat, has a series of teeth or projections on its periphery, which take into the links or openings in the chain between the anchors. Under some circumstances it is supposed that by using a heavier chain, the anchors may be dispensed with, as the chain alone in such cases will have sufficient hold or traction on the ground, to enable the steam drag to draw the boats or barges attached to it; while there will be much less disturbance and injury done to the bed of the river or canal. The claim is for propelling vessels on rivers or canals by means of an endless chain or band passed over pullies situated at the stem and stern of the boat, and having part of the length lying along the bottom of the river or canal, for the purpose of obtaining a hold thereon, or means of resistance therefrom, as aboved described, whether such endless chain is used in conjunction with anchors or not. [Although but now selected this plan was published a year or two ago.]

RICHARD PROSSER, BIRMINGHAM, CIVIL ENGINEER, *for certain improvements in manufacturing buttons from certain materials which improvements in manufacturing are applicable in whole or in part to the production of knobs, rings, and other articles from the same materials.*—Enrolment Office, Dec. 17, 1840.

Potters have been in use to manufacture certain clays and clayey earths, with or without an admixture of other ingredients, as also occasionally some of the said other ingredients (as flint, felspar, &c.) with or without an admixture of clay or clayey earths, into articles of various forms and for various purposes; and in order to reduce these ingredients into a sufficiently plastic state to be worked by the hand of the potter, or otherwise, have hitherto been in the practice of mixing or tempering the same with large quantities of water, and so converting them into an aqueous mass, which is afterwards by partial evaporation or drying, brought into the kneadable state technically called "slip." And in order to expel the large portion of water still remaining in the "slip," it has been necessary to subject the articles formed of the same, to certain drying processes of a laborious and tedious description: in the course of which the articles so manufactured are subject to great shrinkage and change of form, which is extremely prejudicial in the case of all small articles, such as buttons, knobs, rings, &c.

The nature of the present improvements consists, firstly, in manufacturing from the same materials as are ordinarily used by the potter, most if not all those articles which have been or may be manufactured therefrom, but more especially the small articles before mentioned—without the addition of any water to the said materials; whereby the whole of the before named processes of watering or tempering, evaporating or drying (except so far as water may be required in the grinding process), are dispensed with; and all the trouble, delay, and other drawbacks attendant thereon, avoided; and, secondly, in the manufacturing from the said materials, and others, a button of the improved form hereinafter described.

In the first place, clay or clayey earths in their natural state, are pounded or ground into powder; if in their natural state they contain too much moisture to undergo this process, they are to be evaporated until the required degree of dessication is obtained. If an article is wanted of a finer quality than can be manufactured from clay alone, so much of any other suitable substance (as flint, feldspar, &c.) as potters are in the habit of using for making earthenware or porcelain, is to be added, in the state of powder, and in such proportions as will produce the quality required.

Instead of pounding or grinding the materials separately, and mixing them in the

state of powder, they may be ground together, when equally in a state of dryness fit for the purpose. The powdered material thus obtained is to be thrown upon a sieve, having about two thousand apertures or meshes in each square inch, and as much as passes through this sieve is in a state of comminution sufficient for most articles requiring a fine smooth surface. Where so fine a surface is not required, a coarser sieve may be used, taking care that the powder is always of a uniform state of granulation, and not made up of very fine and very coarse particles mixed together. To manufacture such powder into buttons, and other similar articles, a fly-press with suitable dies or moulds are employed. The fly-press is firmly secured to a strong bed or frame: a die carrying on its under face the form in reverse (*i. e.* hollow instead of relief,) proposed to be given to the top of the button, is screwed to the follower of the press. A second tool or die of a sort of T shape, with an impress of the back of the button, fits loosely into a corresponding recess in the bolster. Below the press there is a treddle supported on a fulcrum near its centre, from one end of which a rod passes up through a small hole in the bolster to the lower die or tool. The hollow or recess in the bolster in which this tool rises and falls, is of such a depth, as to be an exact measure of the quantity of powder necessary for the formation of a button; so that this part which may be called the mould serves the double purpose of a gauge for the powder, and a ring or collar to prevent its spreading laterally when the upper tool is brought down upon it. The mode of operation is as follows; the hollow in the mould being filled with powder, and the powder squared off to an exact level with the top of the mould, such power is applied to the press, as will bring down the tool with a force of about 200 lbs. on the square inch, upon the powder lying in the mould, when a solid button is at once formed, which when afterwards fixed in the ordinary way will be found of great hardness, and susceptible of very little if any alteration of form by subsequent exposure to heat or moisture. In order to remove the button thus formed from the mould, the workman gives a contrary turn to the handle of the press, which raises the upper tool, he then presses down the treddle with his foot, which raises the rod at its opposite end, and along with it the lower tool to the top of the recess in the bolster, when the button is removed by hand. The treddle is then released when the lower die descends to its place at the bottom of the recess, when it is in its original state ready for a repetition of the process. If the button is to have a metallic shank attached to it, a recess is formed at the back of the button for its reception, by a corresponding projection on the face of the lower tool or die. The shank being affixed to a small metal cup which is dished so as nearly to fill the recess in the back of the button, a little of any strong cement as shell-lac, &c. is introduced into the recess and while it is in a fluid state the cup of the shank is inserted. When the cement becomes cold the shank will be found sufficiently firm for all purposes to which buttons are usually applied. If a button with holes through it, instead of a shank attached, such as the common four-hole brace button, is required, then tools must be employed, so cut on their upper and lower surfaces, as to produce these holes.

The new form of button, which possesses several decided advantages over the common four-hole button, has only two holes instead of four, with a groove or channel in the upper surface between them: so that when sewn to any garment, the thread will lay in the groove or channel and be thereby protected from abrasion. There is a projection on the back of the button corresponding to the indentation in its front surface, and if the button is sewn on as it should be, in such a manner that the two holes shall be in a straight line with the length of the button-hole, the button will be always inserted with less widening and wearing of the button-hole than is usual with the four-hole button.

The tools necessary for applying Mr. Prosser's process to the manufacture of rings, knobs, and such like articles, are very fully described, but would not be intelligible without the drawings. All that is necessary in each case is to vary the face of the tools according to the configuration desired, by any of the ordinary processes of engraving or cutting, in hollow and relief. A great advantage attending the facility of giving any sort of figured surface to the manufactured article is, that the commonest articles such as bricks and tiles, when manufactured by the improved process, may have at a very small additional cost, any degree of excellence in point of design given to them. A brick produced with *plain* tools by the foregoing process, would have no advantage over bricks made in the ordinary way, except in the greater quickness and economy of the process of manufacture; but instead of the tools being perfectly *plain*, they may be engraved of any form whatever, either in hollow or relief, so as to represent coats of arms, architectural ornaments, &c., and the brick will be produced as readily, and in a state of as great perfection from the graven as from the plain mould; a result considered to be wholly unattainable by any of the modes heretofore in use. When the buttons, or other articles manufactured in this way have

been removed from the press, they are ready to be immediately burned in the same way as articles of earthenware or porcelain are commonly burned; and any required colours may be obtained by adding such metallic oxides to the powdered clay, as potters are in use to employ for the production of these colours. After burning, the articles may receive any degree of decoration by printing, gilding, enamelling, or glazing, that fancy may dictate, in the ordinary manner. When the dies do not exceed two inches in diameter, they are preferred to be made of steel, but when they are of larger dimensions, cast iron answers the purpose very well.

[The patentee calls his process the *dry* process of pottery and brickmaking, in contradistinction to the ordinary processes, in all of which large quantities of water are employed; and certainly it is a process not only of entire novelty, and founded on philosophical considerations of a much profounder character than any developed by the specification, but one which must *produce quite a revolution in this important branch of our arts and manufactures.*]

THE ORIENTAL STEAMER.

Abstract of the Log of the Peninsular and Oriental Steam Navigation Company's Steamer *Oriental*, John Soy, Commander, on her second voyage from England to Alexandria and back:—

	Ports.	Distance in Miles.	Hours under Steam. H. M.	Remarks.
Out.	Falmouth to Gibraltar .	1,009	143 25	Tremendous gales during three days.
	Gibraltar to Malta	989	91 0	Fine weather, average speed 11 knots per hour.
	Malta to Alexandria ..	827	83 15	Fair weather.
Home.	Alexandria to Malta ..	805	93 30	Heavy head sea.
	Malta to Gibraltar	981	103 0	Fair weather.
	Gibraltar to Falmouth .	1,074	118 5	Heavy gales during three days.

Steamed, out, 2,885 miles, in 317 hours 40 minutes.

— home, 2,880 miles, in 314 hours 35 minutes.

Total distance .. 5,765 miles, in 632 hours 15 minutes.

Lowest average rate of speed from Falmouth to Gibraltar, violent gales, 7½ knots per hour. Highest average rate of speed, 11 knots per hour.

NOTES AND NOTICES.

Mechanical Chimney Sweeping.—By an act passed in the last session of Parliament, the employment of mechanical means for cleansing chimnies in future, seems to be pretty well provided for. In addition to other stringent clauses, it is enacted, that " from and after the 1st day of July, 1842, any person who shall compel, or knowingly allow, any child or young person under the age of twenty-one years to ascend or descend a chimney, or enter a flue, for the purpose of sweeping, cleansing, or coring the same, or for extinguishing fire therein, shall be liable to a penalty of not more than TEN, or less than FIVE POUNDS."

The Blast in Iron-smelting Furnaces was originally produced by means of bellows; and so strong was the prejudice in favour of this method, that when the iron cylinders were first proposed it was with the greatest difficulty they obtained a trial; nor was it till after the lapse of several years that the " stubborn fact" of their producing twice the quantity of iron which had been ever reached by the old bellows, led to their universal adoption. The Tintern Abbey Works were the first at which cylinders were employed. The density of the blast furnished by the bellows rarely exceeded one pound on the square inch, but the increase through the employment of the cylinders is in some instances fourfold, and on the average more than double.—*Mechanics' Almanack.*

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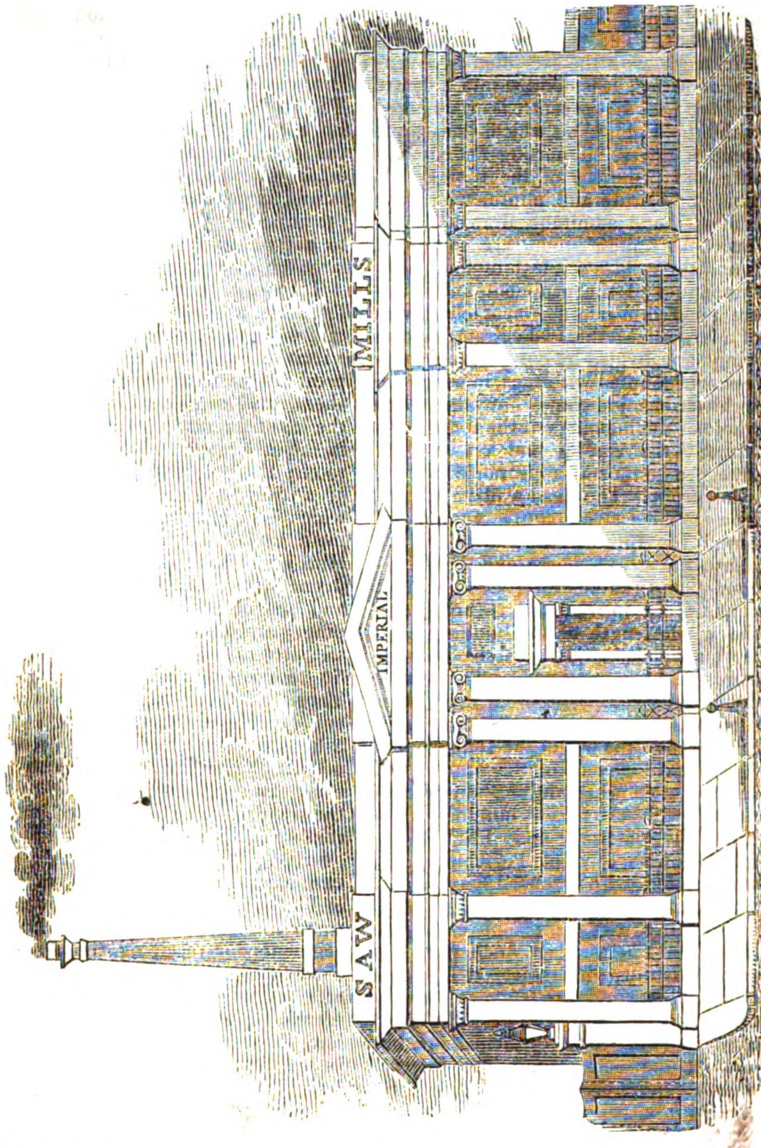


THE IMPERIAL SAW MILLS.

THE IMPERIAL SAW MILLS.

The Imperial Saw Mills, represented on our front page, have been recently erected on the west side of Wenlock-road, City-road, on the bank of the City Branch of the Regent's Canal. The building is of brick, upon a concrete foundation three feet thick, with an additional foot under the chimney shaft. The east front is of solid brickwork, with the exception of a central doorway; it is divided into a centre and two wings: the centre is ornamented with a bold plinth on which stand four Ionic pilasters, supporting an entablature and pediment of the same order. This entablature and plinth, which are cemented and admirably drawn and coloured to imitate stone, are continued round three sides of the building. The tympanum of the pediment and wings are lettered in raised cement characters of a large size; the two extremes of the wings are divided by composition pilasters, surmounted with caps, in which the architect has judiciously introduced the whole of the members of the Ionic order without the volutes and crown leaf, giving a uniform appearance to the whole front. The dead wall is relieved by a moulded string-course running all round the three fronts; between the plinth and string-course, and the string-course and entablature, double sunk pannels are introduced. Throughout the whole length of the building (190 feet) a handsome and massive bronzed iron railing is inserted. The centre doors have composite architraves, cornice, and tablet, supported by two trusses composed of the eye of the Ionic volute. At the extreme end of the south front, there are two neat counting-houses, connected with the main building by a handsome gateway, and brick piers finished with caps of Portland stone, surmounted with bronzed gas lamps. The south or working front, is composed of brick piers and cast iron sashes and frames, over which there is a row of dentills which gives a lightness of appearance and also tends to support the entablature and cornice. The west front is similar to the principal one, but without the pediment. The internal walls are quite plain, the building being divided into two distinct parts, communicating by iron doors fixed in stone door cases; the one part contains the steam-engine, boilers, &c., with adsing and glueing rooms over them; the other, containing the saws and machinery connected therewith. A very important feature about this building is the precautions that have been taken to prevent vibration; for this purpose, a projecting course of six inches of stone is carried round the whole of the building, on which the timbers of the floor are laid, and none of them are let into the walls. The whole of the machinery is supported upon brick piers, carried up from the foundation, and is quite independent of the flooring. The stability thus obtained, combined with the accuracy of the machinery, enables the proprietors to cut unusually thin veneers from the largest logs with great facility.

There is a principal chimney shaft 115 feet high, 20 feet square at the base, diminishing to 4 feet at the top, and finished with a composite moulded cap. The principal tie-beams are bolted into iron shoes, and connected with the caps of the iron columns, of which there are six in the mill-room, and three in the boiler-room; the pole plates forming the sides of a trough gutter. The mill-room, which is a lofty and well-lighted apartment, 80 feet long by 41 feet wide, contains six circular saws, viz. one of 7 feet diameter, two of 10 feet, two of 12 feet, and one of 17 feet, with driving, stopping, and reversing gear complete, all driven by one steam-engine of 60 horses power on the basement. There are three cylindrical steam-boilers, (by Horton, Bankside,) cased with ashes and patent felting, to prevent loss of heat by radiation. Connected with each saw is a traversing table, to which the wood to be cut is attached, and carried up to the saw by a rack and toothed gearing; lateral motion being given by two parallel screws placed one at each end of the table. The stays were cast upon the wheel, and ground very true; segments for receiving the saws were then fitted and ground, and the saws afterwards carefully fitted to these segments. All the parts of the machinery have been so nicely and accurately adjusted, that veneers of 14 to the inch are cut from the largest and hardest logs with the greatest ease The saws make about 80 revolutions per minute, the logs advancing about 7 feet in that time.

Every precaution seems to have been adopted to guard as much as possible against the occurrence of accident: the chimney shaft is protected by an efficient lightning conductor, while that portion of the building where the presence of fire suggests the possibility of danger, is cut off by fire-proof communications from that which may be considered the more inflammable part. Gas is the only light permitted in the mill-room, and an elevated tank of water on the roof affords its additional protection against those accidents, to which less judiciously constructed buildings of this class have ever been so liable.

Notwithstanding the size of the saws, and the extent of the driving power, not the slightest vibration is perceptible anywhere; and the superior capabilities of these works promise soon to repay their enterprising proprietors, Messrs. Gabriel and Co., the immense capital expended in their construction.

The combinations of skill and taste—the strictly useful with the ornamental—which pervade this building, are highly creditable to John Combes, Esq., the architect; while the whole of the machinery presents equally unequivocal proofs of the engineering talents of Mr. Topham.

INSTRUCTIONS FOR BLASTING ROCK.

[We extract the following valuable information on this important subject from a paper of "Instructions for Blasting Rock in the Works of the River Shannon," recently issued by the Irish Board of Works, over which General Sir John Burgoyne presides with so much judgment and ability. Blasting, as ordinarily conducted, is a mere system of guess work, and, consequently, are of great waste; but here we have demonstrated, with all the precision of mathematical demonstration, how in every given case the greatest useful effect may be produced in the least time, and with the least possible expenditure of labour and materials. The "Instructions" from which we make these extracts will form, we understand, part of a much more extensive paper on Rock Blasting, which will shortly be published in the 4th volume of the Professional Papers of the Royal Military Engineers.—Ed. M. M.]

The charges of powder are not to be regulated in proportion to the depth of the hole bored, as is the common practice, but according *to the length of the line of least resistance,* or thickness of the rock to be blasted.

The line of least resistance will be the shortest line from the bulk of the charge of powder to the surface, if the mass exposed to the action of the explosion be of equal consistence throughout.

Charges of powder, to produce similar proportionate results, ought to be as the cubes of the lines of least resistance.

Thus, if 4 oz. of powder would just have a given effect upon a solid piece of rock of 2 feet thick, 13½ oz. would be required to produce the same effect upon a piece of rock 3 feet thick—that is,

	Cube of two feet, line of least resistance.		Charge in oz.		Cube of 3 feet.		Charge in oz.
As	8	is to	4,	so is	27	to	13½.

Or (which is the same thing) on that *particular datum,* the number expressing half the cube of the line of least resistance in feet, will be the charge in ozs. See the following Table, showing charges of powder for given lines of least resistance, calculated on this principle and on the assumed datum of 4 oz. for 2 feet:—

Lines of least resistance. Ft.	In.	Charges of Powder. Lbs.	Oz.	Lines of least resistance. Ft.	In.	Charges of Powder. Lbs.	Oz.
1	0	0	0½*	4	9	3	5½
1	3	0	1	5	0	3	14½
1	6	0	1¾	5	3	4	8½
1	9	0	2¾	5	6	5	3½
2	0	0	4	5	9	5	15
2	3	0	5¾	6	0	6	12
2	6	0	7¾	6	3	7	10
2	9	0	10¼	6	6	8	9¾
3	0	0	13½	6	9	9	9¾
3	3	1	1	7	0	10	11½
3	6	1	5½	7	3	11	14½
3	9	1	10½	7	6	13	3
4	0	2	0	7	9	14	8¾
4	3	2	6½	8	0	16	0
4	6	2	13½				

This datum will probably answer for most cases, but trials may be made of it in the commencement of any work, and a table drawn up accordingly; in the larger class of explosions, advantages may usually be taken of fissures in the

* In using so small a charge of powder as for 1 foot, a little excess is usually required, but ¾ oz. or 1 oz. will be sufficient.

rock, and other circumstances by which the charges may be greatly reduced.

It is useful at times to know the space in round holes that given quantities of gunpowder will occupy; the following Table will give the means of calculating them:—

Diameter of the Hole.	Powder contained in one Inch of Hole.		Powder contained in one Foot of Hole.		Depth of Hole to contain one lb. of Powder.
Inches.	lbs.	oz.	lbs.	oz.	Inches.
1	0	0·419	0	5·028	38·197
1½	0	0·942	0	11·304	16·976
2	0	1·676	1	4·112	9·549
2½	0	2·618	1	15·416	6·112
3	0	3·770	2	13·240	4·244

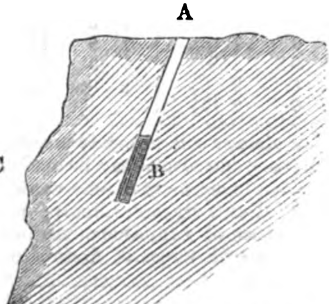
One pound of powder loosely poured, but not close shaken, will occupy about 30 cubic inches; a cube foot weighs about 57½ lbs.

To obtain the full effect of any charge of powder, the line of least resistance, if it be practicable, should not be in the direction of the hole bored.

Thus, if A B, fig. 1, be a hole bored in rock, it should be of such depth and direction that the explosion may find least resistance towards C, and not towards A; B C is then the line of least resistance, and the charge of powder at B will be 4 oz., or 13½ oz., or 2 lbs., according as the thickness B C shall be 2, or 3, or 4 feet, and not in any respect according to the depth of the hole A B. For instance, if B C be 2 feet, the charge at B should be 4 oz., whether the hole A B be 3, 4, or 5 feet, or any other depth.

Fig. 1.

A



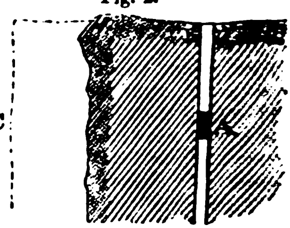
C

It is a difficult question to fix precisely the extent of tamping necessary to force the effect of the explosion in a direction different from that of the hole bored. That extent will be by no means necessarily in a constant ratio with the distances in other directions to the surface, but is dependent also upon other circumstances.

In small blasts (of 2 or 3 oz. for instance) the charge, not being out of proportion to the diameter of the hole, may find a ready vent if the tamping be not considerable, just as in firing a gun; while larger explosions are so far impeded in forcing their way through the small opening occupied by the tamping, as necessarily to produce a great pressure in all directions; thus a charge of a few oz. at A, fig. 2, might blow out the tamping above it, producing at the same

Fig. 2.

C



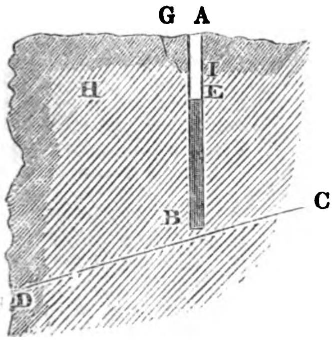
B

time very little effect on the rock; wh the same degree of tamping, or a ve little more, might resist a much lar charge prolonged to B, although it h a proportionate line of least resistance C, more particularly if there be any f sures in the rock, or other circumsta to assist in its rupture; for the in

the rock is opened, the effect of the explosion on the tamping appears practically to cease.

The following strong instance of this actually occurred in granite rock. A hole A B, fig. 3, of 3 inches diameter, was sunk down 11 feet deep, very near to a natural sliding joint C D. It was loaded with 19 lb. 12 oz. of powder, which occupied the space up to E, being 7 feet of the hole, leaving, consequently, only 4 feet for tamping; the explosion brought down the whole mass H, as was intended, leaving, however, a small collar A G I, 2 feet 6 inches deep, in which the tamping (of clay) remained undisturbed.

Fig. 3.

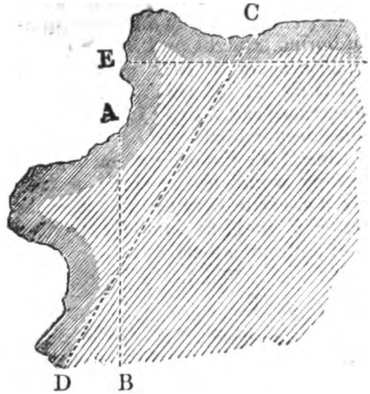


Although importance is attached to not having the tamping blown out, it is not meant that it may not be advantageous to let the shock reach the surface from which the hole was bored; on the contrary, it is desirable that it should do so, as thereby another face for the extension of the effect of the explosion is afforded, instead of its action being confined to one, which, for reasons explained in connection with figures 13, 14, 15, and 16, is the least advantageous.

As rock is usually of very irregular form, where the mass is extensive, as in a quarry, an endeavour should be made to obtain an exposed face tolerably even, either vertical, inclined or horizontal, as A B or C D, or E F fig. 4, then by boring holes parallel to such face, the charges can be better proportioned and adjusted, than when working on very uneven surfaces, and their effective action considerably increased.

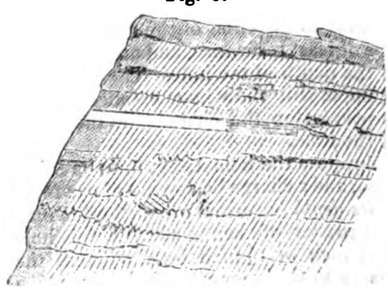
When the rock is stratified, and in close beds and seams, as in fig. 5, the holes should be bored in the direction of

Fig. 4.



the joints, or parallel to them, and the surface to be lifted laid bare, which will give more effect than if the charge be placed across the grain, and the operation of boring will be more easy.

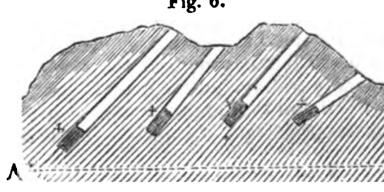
Fig. 5.



In many cases, particularly in clearing away small masses of rock, the position of the charges cannot be arranged in the most perfect manner, still much may be done by bearing the true principles in mind; the explosion should still as much as possible be forced through the solid rock and not by the side of the hole bored, and the length of the line of least resistance should be determined as well as the circumstances will admit.

Suppose it be required to cut down projecting rocks to the lines A B or C D, for a road or canal, &c.—(see fig. 6)

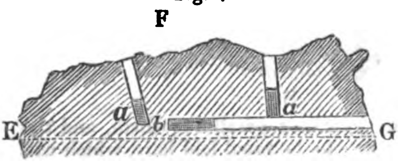
Fig. 6.



much of it may be done by successive charges placed as at *x x x x*, with a great deal more effect than by the usual manner of boring straight down.

Suppose again, a rock of the form A B C D fig. 7, (of which E F G is a cross section,) say, 12 feet long by 3 feet 6 inches deep, which is to be cut down to the line E G: the ordinary manner of proceeding would be by three or four holes *a a a*, vertical or nearly so, whereas the one *c, b*, would no doubt be far more efficient and economical.

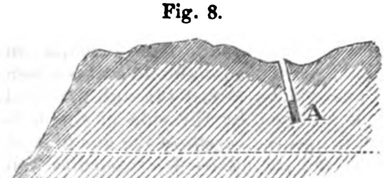
Fig. 7.



Whether the explosion is to be in the direction of the hole bored or not, still the same law must be attended to of proportioning the powder by weight, according to the cube of the length of the line of least resistance, and not according to the depth of the hole. The following example will show how erroneous it is to proportion the charges by the depth of the hole.

Suppose the hole A, fig. 8, to be 3 feet deep, and a charge be applied of *one-third of its depth* (an usual proportion) it may be a matter of chance whether this hole be 1 inch or 1½ inch bore, whereas the charge in the latter case will be *more than double* what it would be in the former, which is manifestly absurd.

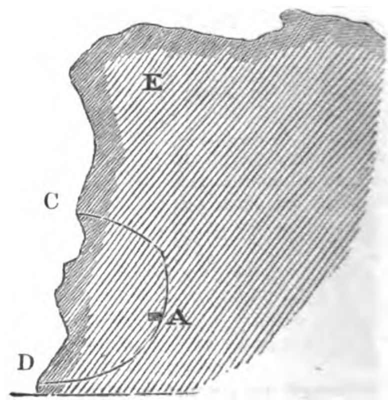
Fig. 8.



In small charges, more powder is commonly used than is necessary; whenever a loud report is heard, or fragments of stone are thrown out into the air, the system pursued whether necessary or not, has not been advantageous; when the best effect is produced the report is generally trifling, but the mass is seen to be lifted and thoroughly fractured without the projection of stones;—it may be observed that though the rock be not apparently fractured by any blast, the explosion will have had *some* useful effect, *provided it has not found its entire vent from the hole bored*, and a second shot from the same hole will be found very effective.

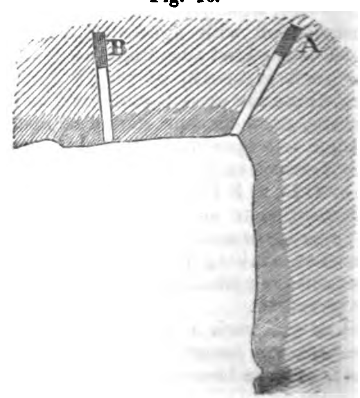
Where there is a high face of rock a system of undermining may be advantageously employed, thus, by a blast at A, fig. 9, an opening may be made from C to D, and the mass E, if not shaken so as to be worked by crow bars or wedges, will be easily brought down by slight subsequent blasts.

Fig. 9.



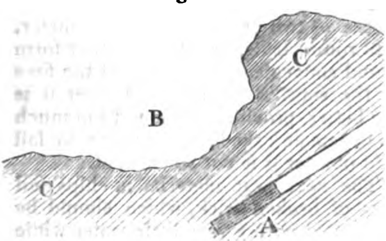
The worst situation for a charge of powder is in a re-entering angle, as at A in the horizontal section, fig. 10. The rock there exerts such pressure all round it, that very little effect can be expected; nor is its position much improved at B.

Fig. 10.



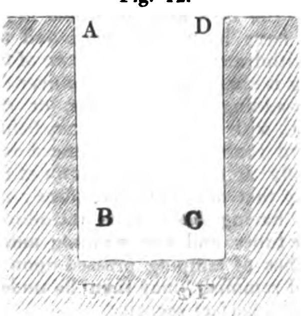
This situation occurs very frequently and should be avoided as much as possible. Thus, a charge at A, fig. 11, would have a line of least resistance to B, but the force of the explosion would be greatly reduced by the masses C C, and the charge must be increased accordingly.

Fig. 11.



This inconvenience is strongly exemplified in cutting through any narrow confined space, A B C D, fig. 12, such as in sinking a shaft or making a small gallery; blasts at E and F must be very disadvantageous, and the result, as experience has shown, slow and expensive.

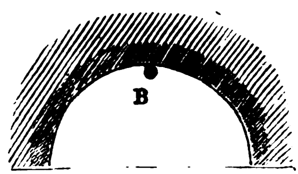
Fig. 12.



The next most unfavourable position, is when there is only one even face exposed: the best mode of operating in such a case is, if practicable, to bore the blasting holes, at the back of or under, and in either case parallel to that face, either vertically, inclined, or horizontally, as the case may be, and proceed as shown in fig. 1.

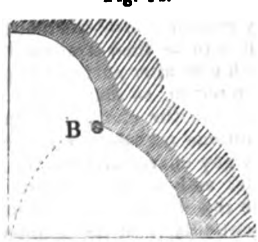
The most favourable position of all is in a projection, and the advantages are greater, in proportion to the number of faces to which the action of the blast can be extended, thus, A B C D, figs. 13, 14, 15, and 16, (viewed in plan) being holes sunk to such depth as to cause the explosion to find vent at the side, it will be seen by the blank spaces, showing the assumed effect, how the result is increased with the same expenditure of powder and labour by the greater number of faces exposed, or within reach of the effect of the explosion; the advantages, however, would be even more than appears by these figures, because at B, C, and D, the effects of the explosion would extend farther in the direction of the exposed sides, than where closely bound laterally as at A;—that is, smaller quantities of powder would answer for equal lines of least resistance, in the cases shown by figs. 14, 15, and 16, than would be required in the case shown by fig. 14.

Fig. 13.



With regard to the practical mode of working, it is not considered necessary here to advert in detail to the tools to be used in boring the holes, or the best mode of preparing them, as these are subjects very generally understood, but it may be well to observe that every means consistent with the execution of the greatest quantity of work in a given time, should be resorted to, in order to lessen, by the use of good materials,—by good workmanship, and the best application of both,—the great consumption of iron and steel which usually takes place in works of this kind.

Fig. 14.



Much good may also be done by carefully adjusting the weight of the hammers or sledges to the length of the jumpers and diameter of the bits used in boring the holes, and generally, it will be desir-

able to observe how far any alteration in the form, weight, or application of these tools tends to increase the quantity of work done by the same men in any given time.

Fig. 15.

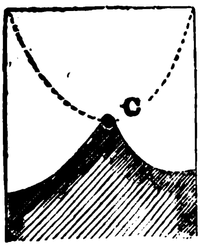
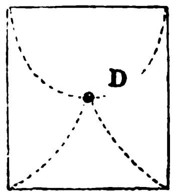


Fig. 16.



For loading correctly, with safety, despatch and with economy of powder, the miners should be provided with copper measures, tubes and funnel, by means of which, any quantity of powder may be introduced, and made to pass clear down to the end of the hole without a possibility of leaving any hanging on the sides to be wasted or to occasion accident.

When the holes are horizontal, or so nearly so that the powder will not run down, it must be pushed through the tube with a wooden ramrod or made up in cartridges and passed into the hole.

The powder may be taken out to the works in copper canisters, properly prepared for use, as well as for security against loss, accident or wet.

The safety fuse, for firing the charge, is to be employed on all occasions.

A piece of fuse is to be cut off by measurement according to the depth of the hole and the charge, so that an inch or two may remain above the mouth of the hole; it is to be then straitened and inserted with care after *part* of the powder has been put in, so that its end may be well buried in the charge; the principal precautions necessary are, that it does not by any curve catch on the side of the hole, and so, by doubling up, fail to reach the charge; and that in the tamping, particularly at its commencement, the fuse does not get drawn out of the charge: by being careful in these points, there will very seldom be a failure or miss-fire; should a miss-fire occur, however, the tamping is not to be bored out again, as it is a very dangerous practice. *See Appendix, for further directions for using the Safety Fuse.*

For tamping, the best material, as well for efficiency as for safety, is dried clay, and as there are very few districts of country where it is not easily to be obtained, it is that which is recommended to be generally used.

The clay may be rolled into cylindrical pieces of two or three inches diameter, into round balls, or into any other form found convenient, and dried at the fires of the smith's forges;—the drier it is the better, provided it be not too much so to remain caked, if so dry as to fall into powder it is not so efficient.

The next best material is chips and dust of broken brick, which should be moistened with a very little water while being rammed.

Loose sand is thoroughly inefficient; and quarry rubbish or chips and dust of the stone itself (being that which is commonly used) should never be employed, on account of its liability to accident, even although not of kinds that usually strike fire; it is also apt in being rammed to cut the fuse.

After the fuse and the whole of the charge have been introduced and the tubes withdrawn, an inch or two of the tamping is simply *pressed down* over the usual wadding of hay, moss, or dry turf, &c., with the tamping bar, before any hard ramming is commenced as it is usually at the first few blows of the ramming that accidents take place; the powder having been thus introduced with the tubes, and the wadding and a few inches of tamping pressed upon it, the hard ramming may then be undertaken with perfect security.

This partial looseness of the material near the powder will not only lessen the liability to accident, but tend to increase the effect of the explosion, as it is known that a slight hollow near the charge has that effect.

If these precautions are thoroughly attended to, and the resident engineers and overseers are particularly enjoined to see that they are never neglected, no accident by premature explosion can ever occur.

It will be the duty of the engineer to keep a detailed account of any accidents which may occur during the execution of the work, and having thoroughly in-

vestigated the cause of such accidents, to report them to the commisioners, and enumerate them in the general report hereinafter referred to.

Wherever there may be a necessity for blasting under water or in wet holes, the miners must learn how to prepare the water-proof bags or cartridges, and the mode of applying the particular fuse that is made for that purpose, called sump fuse, as well as the manner of tamping with sand and cones with wedges, where of sufficient importance, and that the clay cannot be rammed. The following is the mode of tamping referred to:—

Having placed the cartridge bag with the necessary quantity of powder therein and sump fuse attached, in the hole, a sufficient quantity of sand, or sand and clay, is to be poured in to fill the hole to within three or four inches of the top; a cast or wrought iron cone, having a groove to receive the fuse, is then to be let into the hole, and secured therein by means of three or more (according to the diameter of the hole,) wrought iron arrows of about three-eighths of an inch diameter, used as wedges—a piece of rope fastened to the cone is to be passed through the eyes of these arrows, and made fast to a piece of wood as a buoy to prevent their being lost upon the explosion of the charge. The resistance offered by the cone, if properly secured, will be found generally sufficient to prevent the escape of the charge through the hole, its effect in this respect will be improved by having a wadding of hay, grass, or other fibrous matter on the sand under the cone. *(See the Appendix for a further account of blasting under water.)*

APPENDIX.

Extracts *from papers published by Messrs.* Henry, Mullins, *and* M'Mahon, *relative to the use of Patent Fuse.*

Directions for using the Miners' Fuse, or Safety Rod.

The following directions will be found sufficient to enable persons acquainted with blasting, to use the fuse with convenience and safety:—

I.—Let it be used solely for the purpose of blasting, and not to bind up tools, or to serve instead of cord for any purpose whatever.

II.—Let it be kept in a place that is tolerably dry until wanted for use; it is believed, that if the fuse be suffered to remain a considerable time in very damp or mouldy places, it may be injured fully as much as if it had been all the while kept in water.

III.—Those men who work in very wet places should ask for *Sump Rods* of the person appointed to deliver the materials, as these are intended expressly for that purpose.

IV.—There should, in all cases, be some powder put into the hole before the fuse, that the fire may be certainly communicated to dry powder.

V.—Before the fuse is placed in the hole, the outside or countering-thread should be stripped down about an inch at the upper end. This will make it take fire sooner, and lessen the quantity of smoke, which will be an advantage. The fuse will take about half a minute to burn a foot in the open air, but a little more time should be allowed it when tamped.

Extract *from a paper by Messrs.* Henry, Mullins, *and* M'Mahon, *relative to the use of Patent Safety Fuse, or Sump Fuse, in Blasting under Water and Damp Places.*

The application of the patent safety fuse renders the operation of blasting rocks under water greatly more facile, expeditious, cheaper, and, beyond all comparison, less hazardous than the process heretofore in use. Indeed, it is barely possible that an accident can occur in using powder for the purpose of blasting, to the explosion of which the safety fuse is applied. The former practice of charging, in a tin cylindrical tube, inserted in the hole previously drilled in the rock (the depth and diameter of which was proportioned to the site, quality, and magnitude of the rock), so as to receive a sufficient quantity of powder, lodged at such a depth in it, as to produce upon ignition the effect sought, was obviously bad. The tube containing the charge was put into the hole from the diving bell, its length being adapted to the height from the bottom of the hole in the rock to the chamber in which the operations were carried on, a series of tubes, having water-tight joints, were then added, consecutively, the bell being elevated to adjust each successive joint until the final joint was carried a few inches above the surface of the water, when a small piece of red-hot iron was dropped into it, by

which the powder below was ignited. The process adopted at Kingstown is to charge the hole (drilled as before) with a water-proof cartridge, into which one end of the sump fuse is inserted; the hole is then tamped (wadded in the usual way), and a length of fuse appended sufficient, while it is burning to the charge, to admit the bell being moved *laterally* out of the perpendicular line of the explosion; the length of the fuse being accordingly adjusted, a fire is struck with flint, steel, and match-paper, and set to the fuse, which, when lighted, is thrust out under the mouth of the bell, to prevent its being filled with smoke; *and so left to burn its way, through the water, to the charge in the rock.* In the interim the signal is given for moving the bell a few feet out of the line of the fire; the fuse burning at the rate of 3 feet a minute. A piece of 4, 5, or 6 feet at most, in length, will afford sufficient time to place the bell in the required position. The blasting now performed at Kingstown, in the preparation of the foundation of the wall of the new Commercial Wharf erecting there, is in 22 feet water, at low water of spring tide.

The advantages arising from the use of the safety fuse in these operations, independently of the security it affords against premature explosion and consequent hazard of loss of life or limb, are obviously of great importance.

Firstly—The charge being tamped in the ordinary way, produces a considerably greater effect from a lesser quantity of powder than if placed in the tube, which does not admit of tamping, being open to the top, to receive the fire; thus a saving in the article of powder is made, and more work done at less cost.

Secondly—Whatever the depth of the water may be, five or six feet length of fuse will be sufficient for each shot, whilst the length of tube required must necessarily exceed the depth of water, which at Kingstown, according to the time of the tide, is from twenty-two to thirty five feet.

Thirdly—The fuse is much cheaper than the tubing, the greater part of which (the tubing) is destroyed by each shot.

Fourthly—In using the fuse the bell need not be raised to a greater height that at which it rested during the drilling, charging, tamping, and firing the hole; with the tube, the bell, five tons weight, must be raised entirely out of the water before the fire can be communicated, whilst in the former case it is merely pushed horizontally a little out of the line of the fire, and in a few minutes, four or five at most, it is restored to its birth to quarry and load in the bucket the ruptured rock, or to prepare for another shot, as the case may be. In this particular instance alone considerable time and labour is saved.

The fuse is not less efficacious in its application to powder used in blasting in wet quarries above ground. Heretofore much time and labour were lost in staunching, as it is called, wet holes in rocks so situated. A rock might appear wholly free from water until bored, when the hole serves as a conduit to discharge the water filtered into it through the water joints in the rock; when this happens, which is a very common case in most quarries, the hole must be dried or abandoned, the drying or staunching frequently miscarries, so that a re-bore becomes necessary, in which case great hazard is incurred, time, labour, and powder lost, all of which are obviated by the water-proof charger and fuse; so that in any way that it is applied to the purpose of blasting, it is an invention conferring great benefit on the community at large, particularly upon the working classes, whose condition in earning their daily bread exposes them to imminent peril in such hazardous undertakings.

The water-proof charger must be made of canvas or sail-cloth, into a bag of the diameter of the hole, and of a sufficient length to contain the requisite quantity of powder; one end of the sump fuse, unravelled for about half an inch, is then to be inserted in the neck of the bag, and tied with a strong thread. The bag, thus prepared, is to be twice or thrice dipped into boiled tar, when it is fit for use.

INSTITUTION OF CIVIL ENGINEERS. — TELFORD PREMIUMS.

The Council of the Institution of Civil Engineers have awarded the following TELFORD Premiums, for the present year, 1840:—

A Telford Medal in Gold to Josiah Parkes, M. Inst. C. E., for his two Papers "On Steam Boilers," and "On Steam Engines,

principally with reference to their Consumption of Steam and Fuel," published in the 1st and 2nd Parts of vol. iii. of the Transactions.

A Telford Medal in Silver, and Books, suitably bound and inscribed, of the value of ten guineas, to James Leslie, M. Ins. C. E., for his "Account of the Works of Dundee Harbour," with Plans and Drawings of the Works and the Machinery employed there.

A Telford Medal in Silver, and Books, suitably bound and inscribed, of the value of five guineas, to Robert Mallet, Assoc. Inst. C. E., for his Paper "On the Corrosion of Cast and Wrought Iron in water."

A Telford Medal in Bronze, and suitably bound and inscribed, of the value of three guineas, to Charles Bourns, Assoc. Inst. C.E., for his Paper "On Setting-out Railway Curves."

A Telford Medal in Bronze, and Books, suitably bound and inscribed, of the value of two guineas, to Henry Chapman, Grad. Inst. C. E., for his "Description and Drawings of a Machine for describing the Profile of a Road."

A Telford Medal in Bronze, and Books, suitably bound and inscribed, of the valve of two guineas, to Heary Renton, Grad. Inst. C. E., for his "Description and Drawing of a Self-acting Wasteboard on the River Ouse."

Books, suitably bound and inscribed, of the value of five guineas, to Eugenius Birch, Grad. Inst. C. E., for his "Drawings and Description of the Machine for Sewing Flat Ropes, in use at Huddart's Rope Manufactory."

Books, suitably bound and inscribed, of the value of two guineas, to T. J. Maude, Grad. Inst. C. E., for his "Account of the Repairs and Alterations made in the Construction of the Menai Bridge, in consequence of the Gale of January 7th, 1839.

Books, suitably bound and inscribed, of the value of two guineas, to Andrew Burn, Grad. Inst. C. E., for his Drawings of a "Proposed Suspension Bridge over the Haslar Lake."

Telford Premiums for 1841.

The Council of the Institution of Civil Engineers give notice that they will award, during the ensuing Session, TELFORD Premiums to Communications of adequate merit on the following subjects:—

1. An Account and Drawings of the original construction and present state of the Plymouth Breakwater.
2. The alterations and improvements in Blackfriars Bridge.
3. The recent repairs to the Eddystone Lighthouse.
4. On the best Gauge for the width of Railways, with the result of the experience of existing Railways.
5. On Stone Blocks and Timber Sleepers, or Sills, with and without continuous Timber Bearings, as foundations for Rails.
6. The ratio, from actual experiment of the Velocity, Load, and Power, of Locomotive Engines on Railways, with the resistance to progressive motion at different velocities.
   1st. Upon Levels.
   2nd. Upon Inclined Planes.
7. A Statement of the Cost of Transport on Railways in Great Britain by Locomotive Engines, including the repairs, maintenance of way, and all incidental expenses.
8. Ditto by Stationary Engines, on levels or on inclined planes, including all repairs, maintenance of way, and incidental expenses, with Drawings and Description of the Engines and Machinery.
9. The causes of, and means of preventing, the Priming of Steam Boilers.
10. The quantity of Water evaporated from Steam Boilers during experiments of not less than 12 hours' duration, if possible; including the consumption of fuel, its nature, the form and dimensions of the boilers and grates, the surfaces exposed to heat, their material and strength, and any other particulars.
11. The quantity or weight of Water consumed as Steam by any kind of Steam Engine, in the production of a definite effect; with an account and Drawings of the Engine, nature of the load, and methods employed to ascertain the absolute and useful effect of the Steam.
12. The best description of Meter for registering accurately the quantity of Water used for Steam Boilers, or other purposes.
13. The explosion of Steam Boilers; especially a record of facts connected with any explosions which have taken place: also, a description, drawings, and details, of the Boiler, both before and after the explosion.
14. Drawings, Sections, and Descriptions, of Iron Steam Vessels.
15. The comparative advantages of Iron and Wood as employed in the construction of Steam Vessels.
16. On the various kinds of Sheathing employed in the protection of Vessels, and their relative advantages.
17. Drawings and Descriptions of the Engines, Boilers, and general construction of Steam Vessels of the largest class, with a comparative tabular Statement of the dimensions of the parts of Engines of different powers, and their effect compared with that of smaller Engines.
18. On the use of high-pressure Steam on board Steam Vessels, with drawings and description of the Boilers.
19. On the best relative sizes of Steam Vessels of all classes in comparison with their Engine Power; illustrated by reference

to Steam Vessels already constructed, and giving their size, tonnage, speed, consumption of fuel, &c.

20. On the best application of different kinds of fuel under the Boilers of Steam Engines, especially with reference to obtaining perfect combustion, illustrated by drawings of the Boilers.

21. On the application of the Screw to propelling Vessels, and a comparison between it and the common Paddles.

22. Common Sewers in cities; the rules for and details of their construction.

23. Drawings and Description of the Outfall of the King's Scholar's Pond Sewer.

24. Drawings and Descriptions of the Sewerage under the Commission for Regent Street, especially of the Outfall at Scotland Yard.

25. Plans and Sections of Blast Furnaces, with the necessary Mine Kilns, Hot-Blast Stoves, and general arrangement of an Iron Work, with a description.

26. The comparative advantages and disadvantages of Hot and Cold Blast in the manufacture of Iron, with statements of the quality and quantity of materials employed, and produce thereof.

27. An Account of the various methods lately employed for preserving Timber from Dry Rot and other sources of decay; with the results of experience as to the kinds of Timber most applicable for Engineering works, and other situations where speedy destruction at present occurs.

28. A Memoir of Sir Hugh Middleton, with an Account of his Works.

29. A Memoir of Arthur Woolf, with an Account of his Works.

30. A Memoir of Jonathan Hornblower, with an Account of his Inventions and Works.

31. A Memoir of Richard Trevithick, with an Account of his Inventions and Works.

32. A Memoir of William Murdoch (of Soho), with an Account of his Inventions and Works.

The Communications must be forwarded to the House of the Institution, No. 25, Great George Street, Westminster, on or before the 31st of May, 1841.

The Committee state that it is not their wish to confine the TELFORD Premiums to communications on the above subjects; other communications of acknowledged merit, and peculiarly deserving some mark of distinction, will be rewarded.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM SOUTHWOOD STOCKER, BIRMINGHAM, *for certain improvements in machinery applicable to making nails, pins, and rivets.*—Enrolment Office, Dec. 2, 1840.

Upon a strong frame, a cranked axle is mounted, furnished with pullies for receiving motion from a steam-engine or other prime mover; four iron bars slide horizontally backward and forward in a suitable frame, by means of a connecting rod from the crank shaft; these bars are fastened at one end to a plate and work through another furnished with suitable openings. In these horizontal bars others are placed which have a motion at right angles to them; these bars carry the forging tools, consisting of rollers, either grooved or plain, according to the nature of the work to be produced. The opposite ends of the latter bars or tool-holders, are furnished with anti-friction wheels, which act against inclined planes, for the purpose hereafter stated. A pipe or tube lays horizontally along the machine, its end reaching nearly to the position of the forging tools; through this tube the workman introduces a rod of the metal to be forged, the motion of the crank draws the sliding bars inwards, when the anti-friction wheels coming in contact with inclined planes, the forging tools are brought together upon the hot iron, which is worked to the size and shape required. By this means a square, angular, or cylindrical bolt can be produced of any required length or size, with a head of any determined shape, so as to produce spikes, bolts, rivets, &c., with great facility and precision. The stem of the bolt, &c., being forged, is to be finished by a heading machine, of which two forms are described. In the first there is a pair of shears worked by cams which cut off the stated lengths from a rod of metal. A cranked shaft works a heading die, which strikes the bolt as it lies in a suitable position for receiving the blow, in a hole of the proper size. A smaller hole is continued through, in which a small steel wire slides, being kept back by a spiral spring, but urged forward after the heading die has struck a blow, by the revolution of a cam driven by a bevil wheel from the crank shaft. In the other machine, which is intended for heading spikes, nails, &c., the arrangement is somewhat similar to the foregoing, but that the articles, instead of being placed in fixed permanent holders, are placed in grooved dies, one moveable the other fixed, which are laid into the machine and held securely by a lever and spring catch. A number of these moveable dies are used with the machine, so as to ensure a constant and rapid supply of the spikes, &c., in a hot state, to receive the blow which finishes the head.

The fourth part of this patent relates to the manufacture of cut brads and nails, the improvement consisting in turning the strips of metal by the motion of the machine itself, instead of by hand, as heretofore done. A pair of cutting shears are formed by two long cutters, the lower one being fixed, the upper

one rising and falling in guides by means of the alternating motion of a crank shaft. In front of these cutters a series of cylinders are placed at an angle with them; through an oblong hole in the end of each of these cylinders, a strip of metal of a breadth corresponding to the length of the nail to be produced, projects against a stop. On the end of each of these cylinders a pinion is formed, and takes into a rack which passes along beneath the whole series. On motion being given to the crank shaft, the moveable cutter descends, and cuts off an angular nail or brad from each strip of metal; a sliding movement is then communicated to the rack, which traverses so far as to turn the cylinders and strips of metal half round, when another cut is made, followed by a retrograde motion of the rack, by which means a series of angular pieces are continually cut from the metal strips. There is a contrivance for urging the strips forward to the cutters, but the turning of them between each cut is the principal novelty.

The claim is—1. The mode of combining the forging tools in a moveable frame, and means of causing such tools to approach each other and forge a length of iron properly held in a machine, whether for forging the stem of a nail, pin, or rivet, or for pointing the end thereof, as described.

2. The mode of constructing the heading and cutting machine as described. 3. The mode of applying moveable dies to a machine for heading pins, rivets, or nails. 4. The turning over by machinery, and cutting a series of plates or strips of metal in making cut nails.

Alexander Southwood Stocker, Birmingham, *for improvements in the manufacture of tubes for gas and other purposes.*—Enrolment Office, Dec. 9, 1840.

The improvements which form the basis of this patent are briefly the application to harder metals of the process long since employed for the production of leaden pipes. Short cylinders are cast of a thickness to be determined by the length and substance of the finished tubing that is required. The central aperture is produced in the cylinder by a sand or other core, of the same size as the bore of the tube to be produced, in the usual way of founding. A steel mandril is formed of the size required, slightly tapered (about one-sixteenth of an inch in eight feet); the metal cylinder being heated to a cherry red, the mandril is inserted, and the cylinder passed through a series of grooved rollers gradually diminishing in size, until the proper dimensions are obtained. The first portion of the patent relates to the production of brass tubing, composed of 60 lbs. of best copper, 40 lbs. of zinc, and 14 oz. of tin. The inventor states that this alloy answers very well for the purpose; other, proportions, however, may be used, care being necessary that the mixture is such as will admit of being rolled at the heat mentioned. The second part refers to the use of cast iron in lieu of brass. The cylinders of iron are cast as before directed, and are then subjected to an annealing process. For this purpose they are placed in a proper furnace, and surrounded with rich iron ore: the furnace is then closed and heated to a bright red for eight or more days, according to the thickness of the cylinders, by which time they will be rendered sufficiently malleable to undergo the process described.

The claim is—1. The mode of constructing tubes without seams, of a compound of copper and zinc, with or without tin, by elongating a bored or cast cylinder, while in a heated state. 2. The mode of producing iron tubes without seams, by elongating cylinders made of malleable cast iron.

Christopher Nickels, of York-road, Lambeth, Gentleman, *for improvements in the manufacture of braids and plaits.*—Enrolment Office, Dec. 9, 1840.

In order to form loops or fringed edges to the fabric produced, a stationary mandril or mandrils are applied to the axes of the revolving heads; the braiding threads pass round these mandrils in their evolutions, and are laid thereon. As the work is produced and carried up, it is drawn off these mandrils, so that while the one portion of the braiding threads are continually taken up and produce close braided or plaited fabrics, the rest are worked into loops, forming fringed edges thereto. The second improvement relates to the manner of combining a series of single braids or plaits so as to form one fabric. In the usual course, the fabric leaves the machine in a single complete braid or plait: by the arrangement now patented, the machinery is so contrived, that each set of threads passes into and takes hold of the adjacent set, and thereby produces a broad fabric of closely braided or plaited material.

The claim is, 1. The mode of making braids and plaits with fringed edges or parts, by means of mandrils. 2. The mode of manufacturing braids and plaits, by so arranging the parts of the machines, that the threads may work in sets, and the portions of the fabric produced by the several sets of threads be combined, without the thread passing from selvage to selvage, of a flat fabric, or without performing a continuous circle when working in a circular machine.

Robert Hampson, May-field Print-works, Manchester, Calico Printer, *for an improved method of block printing on woven fabrics of cotton, linen, silk, or woollen, or any two or more of them intermixed.*—Enrolment Office, Dec. 9, 1840.

The nature of these processes is such as to make it difficult, without the illustrative drawings, to give any more information respecting them than is conveyed by the following tolerably explicit claims.

1. The mode set forth of printing with blocks on woven fabrics of cotton, linen, woollen, or any two or more of them intermixed.

2. The combination of contrivances and agents whereby the printing block is caused to descend in a perpendicular direction, with its face parallel to the printing table, in order that it may take up the proper colour from the sieve or sieves, and then impress it upon the fabrics to be printed.

3. The same combination of contrivances or agents, however modified or altered in size, form, or position, yet producing the above effect.

4. The colouring apparatus as described, in which several sieves are separated and held apart, to admit of the separate colours being spread on them, and afterwards closed or brought into juxta-position, in order to print the desired pattern, composed of different colours, at the same time.

5. The colouring apparatus, either used in connection with the other machinery, or by itself.

EDWARD JOHN CARPENTER, TOFT MONKS, IN THE COUNTY OF NORFOLK, COMMANDER IN THE ROYAL NAVY, *for improvements in the application of machinery for assisting vessels in performing certain evolutions upon the water, especially tacking, veering, propelling, steering, casting or winding, and backing astern.*—Enrolment Office, Dec. 12, 1840.

These improvements are threefold, consisting in the first place, of a method of affixing and adjusting an improved propelling apparatus to vessels, so as to attain the greatest possible speed, with reference to the use of sub-marine rotary propellers on the quarter; Secondly, of a method of applying and adjusting the propelling apparatus so as to turn ships, &c., about in various positions without the assistance of the wind or rudder; and, thirdly, a method of applying a single propeller to the stem of ships or vessels. There are nine diagrams attached to the specification, elucidatory of the construction of the vanes, blades, or screws, which form the submarine quarter propeller, and without which it is difficult to convey a correct idea of their character. When any number of the planes or screws are set or affixed on a shaft, either oblique or vertical to the plane of the axis of that shaft, at the angle of 30° or between the angles of 20° and 45°, for the purpose of moving a vessel in or upon the water, by means of rotation, it is then called a "Propeller." Two spindles or axles to which the propellers are affixed, protrude thrugh the vessel on both quarters, at a point near the line of flotation, below the load water line, and above the keel, between the midship section and the stern-frame. These spindles are enclosed by metallic cylinders or other proper packing, having a cup and socket valve and stuffing box at one or both ends; they are firmly secured to the timbers of a vessel by means of iron or other fastenings. That part of the spindle which is within the vessel, is to be connected to a steam-engine or other first mover by means of a connecting shaft, eccentric rods, bands, or other usual mechanical contrivances. The outer part of the spindle is connected with the propelling shaft, by means of a universal or other suitable joint; with a hinge or some equivalent contrivance, for allowing the propeller-shaft to be raised or detached; by means of a contrivance termed a "regulator." This consists of a rod furnished with a rack and pinion, with a pendant bearing attached to the propelling shaft at the bottom of the rod, through which bearing the shaft passes, so as to be raised or lowered, as circumstances may require. Or, the regulator may be formed of a chain and tackle. A metal stern bearing is bolted firmly into the transom or timbers of the vessel, so as to resist the force of heavy seas against the propeller, and also capable of being easily detached, as circumstances may require: two or more bearings may be thus applied, if required. The end of the propeller shaft may be coupled to the arms or supports of the bearing in such a manner, that the upper end of the propellers may be raised or lowered, as before described; but in either case the invention consists in projecting the means of raising or lowering a propeller of this description, at the same time securing to it an efficient bearing, without which such propellers would be impracticable for useful purposes.

The second part of the invention refers to a mode of communicating motion to the propellers from the capstan of a vessel: a bevelled wheel upon the capstan, acts upon two pinions connected with the spindles before described. After the apparatus has been coupled together, it is only necessary to turn the capstan round, and the vessel will be turned in an opposite direction to the line in which the force is applied, according to the position of the propellers, or whether one or both are used.

The third part consists of a mode of dividing the rudder, so as to allow the shaft of a single propeller to pass through it without interfering with its movements; and also in the form of the vanes or blades to be applied to such shaft, (of which there are four drawings), consisting principally of arcs or segments of a large circle,—the length of

each vane or blade being more than twice its radius. The outer segmental line is the arc of a circle of such a diameter, that every part of it will be equi-distant from the centre of the shaft, according to the angle at which it is placed: two of these blades are placed angularly upon the shaft, as before described with reference to the quarter propeller. The rudder is divided into two parts, connected together by a strong iron frame, which forms a slot for the propeller shaft to work through. The shaft is supported at its extremity by a hinged bearing, with a regulator or topping lift, for raising it out of the water.

The claim is, 1. The application or adaptation of submarine propellers in the manner above described, in whatever situation such propellers may be placed. 2. The peculiar form of the propellers, as shown in the drawings, in whatever way they may be used.

LIST OF DESIGNS REGISTERED BETWEEN NOVEMBER 30TH AND DECEMBER 23RD.

Date of Registration.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Dec. 1	485	C. Warne	Boot-makers' machine	1 years.
3	486	T. Horn	Mincing machine	3
"	487	G. Hyde	Envelope	1
4	488	T. Hopkins	Carpet	1
"	489	J. C. Bowles	Wafer	1
7	490	Buckley, Brothers	Gambroon	1
"	491	C. Stocken	Bottle stopper	3
"	492	Ditto	Envelope	1
8	493	H. D. Smith	Japanned baize	1
14	494,7	G. and H. Talbot and Sons	Carpet	1
"	498	T. Walker	Stove	3
"	499	J. and J. Walker	Cantoon	1
16	500	W. H. Phillips	Machine for improving draughts in chimneys, &c.	3
17	501	J. G. H. Roukctti	Barometer	3
18	502	Taylor, Brothers	Letter press	3
21	503	D. Smith	Hot gas burner	3
"	504	Lieut. Col. Baron de Berenger	Envelope	1
22	505	G. Clarke and Co.	Cantoon	1
"	506	D. Davies	Railway carriage break	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH OF NOVEMBER AND THE 23D OF DECEMBER.

Miles Berry, of Chancery-lane, patent agent, for certain improvements in looms for weaving. Nov. 27; six months.

John Clay, of Cottingham, York, gentleman, and Frederick Rosenborg, of Sculcoates, in the same county, gentleman, for improvements in arranging and setting up types for printing. Nov. 27; six months.

John Condie, manager of the Blair Iron Works, Ayr, Scotland, for improvements in applying springs to locomotive railway and other carriages. Nov. 27; six months.

George Holworthy Palmer, of Surrey-square, civil engineer, and Charles Perkins, of Mark-lane, merchant, for improved constructions of pistons and valves for retaining and discharging liquids, gases, and steam. Nov. 28; six months.

George Blaxland, of Greenwich, engineer, for an improved mode of propelling ships and vessels at sea and in navigable waters. Nov. 28; six months.

Henry Bridge Cowell, of Lower-street, Saint Mary, Islington, ironmonger, for improvements in taps to be used for or in the manner of stopcocks, for the purpose of drawing off and stopping the flow of fluids. Dec. 2; six months.

James Robinson, of the Old Jewry, manufacturer of machinery, for a sugar-cane mill of a new construction, and certain improvements applicable to sugar-cane mills generally, and certain improvements in apparatus for making sugar. Dec. 2; six months.

Alexander Horatio Simpson, of New Palace-yard, Westminster, gentleman, for an improved machine or apparatus for working pumps. (A communication.) Dec. 9; six months.

William Peirce, of George-street, Adelphi, gentleman, for improvements in the preparation of wool, both in the raw and manufactured state, by means of which the quality will be considerably improved. Dec. 9; six months.

Charles Winterton Baylis, of Birmingham, accounting-house clerk, for an improved metallic pen, to be called the Patent Flexion Pen and improved Penholder. Dec. 16; six months.

George Wildes, of the city of London, merchant, for improvements in the manufacture of white lead. (A communication.) Dec. 16; six months.

James Davis, of Shoreditch, engineer, for an improved mode of applying heat to certain steam-boilers. Dec. 16; six months.

John Steward, of Wolverhampton, esq., for an improvement in the construction of piano fortes, harpsichords, and other similar stringed musical instruments. December 16.

James Molyneux, of Preston, for an improved mode of dressing flax and tow. December 16; six months.

Charles Botton, of Farringdon-street, gas engineer, for a certain improvement in gas meters. December 16; six months.

Hugh Graham, of Bridport-place, Hoxton, artisan, for a new mode of preparing designs and dyeing the materials to be used in the weaving and manufacture of Kidderminster carpets, and for producing patterns thereon, in a manner not before used or applied in the process of weaving and manufacturing such carpets. December 16; six months.

Joseph Beathic, of Portland-place, Wandsworth-road, Lambeth, engineer, for certain improvements in locomotive engines, and in carriages, chairs, and

wheels, for use upon railways; and certain machinery for use in the construction of parts of such inventions. December 16; six months.

Andrew Pruss D'Olszowski, of Ashley-crescent, gent., for a new and improved level for ascertaining the horizon, and the several degrees of inclination. (A communication.) Dec. 16; six months.

William Tudor Mabley, of Wellington-street North, mechanical draftsman, for certain improvements in producing surfaces to be used for printing, embossing, or impressing. Dec. 17; six months.

Abraham Alexander Lindo, of Finsbury-circus, gent., for improvements to be applied to railways and carriages thereon, to prevent accidents, and to lessen the injurious effects of accidents to passengers, goods, and railway trains. December 18; 6 months.

Elias Robison Handcock, of Birmingham, esq., for certain improvements in mechanism applicable to turn-tables, for changing the position of carriages upon railroads, for furniture and other purposes. December 18; six months.

Richard Coles, of Southampton, slate merchant, for improvements in machinery or manufacturing tanks and other vessels of slate, stone, marble, and other materials, and in fitting and fastening such materials together. Dec. 23; six months.

Benjamin Baillie, of Henry-street, Middlesex, for improvements in locks, and the fixings and fastenings thereto belonging. Dec. 23; six months.

John Brumerell Gregson, of Newcastle-upon-Tyne, Northumberland, soda-water manufacturer, for improvements in pigments, and in the preparation of the sulphates of iron and magnesia. Dec. 23; six months.

Frederick Payne Mackelsan, of Birmingham, and James Murdoch, of Hackney-road, civil engineers, for certain improvements of or belonging to tables, a portion of which is applicable to other articles of furniture. (Partly a communication.) Dec. 23; six months.

George Thornton, of Brighton, civil engineer, for certain improvements applicable to railways, locomotive engines, and carriages. Dec. 23; six months.

John Dickinson, of Bedford-row, esq., for certain improvements in the manufacture of paper. Dec. 23; six months.

David Walther, of Angel-court, Throgmorton-street, merchant, for certain improvements in the methods of purifying vegetable and animal oils, fats, and tallows, in order to render those substances more suitable to soap making, or for burning in lamps, or for other useful purposes, part of which improvements are also applicable to the purifying of the mineral oil or spirit, commonly called petrollum or naptha, or coal oil, or spirit of coal tar. Dec. 23; six months.

John Jones, of Leeds, brush manufacturer, for improvements in carding engines for carding wool and other fibrous substances. (A communication.) Dec. 23; six months.

Joseph Barker, of Regent-street, artist, for improvements in gas meters. December 23; six months.

NOTES AND NOTICES.

Grease adapted to Carriages and Machines of all Sorts.—This composition prevents friction to a great extent, and of course lessens the wear of all rubbing surfaces. Its cost is not comparatively greater than the materials often employed for the purpose. It is not changed by heat, and hence does not liquify and flow away from its proper place.

Recipe.

Black lead, pulverized	50 parts, by weight.	
Hogs' lard	50	do.
Fresh soap	50	do.
Quicksilver	5	do.

At first amalgamate well the lard and mercury, by rubbing them together for a long time in a mortar. Then gradually add the black lead, and lastly the soap, mixing the whole as perfectly as possible.—*Rec. Soc. Polyteck. Jan.* 1839.

Duck Paddle-wheel.—We copy the following from the *Argus*:—" A series of experiments have recently been tried in France by the Marquis de Jouffroy, with the view of getting rid of the inconveniences of the ordinary steam paddle. The apparatus of M. de Jouffroy consists of two palms, or articulated duck's feet, placed either at the sides or stern of a vessel, having an alternate motion, so as to open in order to give the impulsion, and close again precisely the same way as the foot of a duck. M. de Jouffroy's first experiment was made in the canoe of the Jardin de la Folia St. James, near the Bois de Boulogne, with the model of a frigate made on a scale of 1 foot to 37 feet, and so constructed that the common paddle or his improvement might be used at will. With the common paddle the vessel performed a distance of 130 feet in seven minutes. The paddles having performed 130 revolutions, at this time the propelling power was completely exhausted. The common paddles were then taken off, and the duck's-foot paddles substituted. With 130 oscillations of these paddles the vessel performed, in the same space of time, a distance of 153 feet; but what was most remarkable, was the fact that instead of stopping short when the clock-work (which in both cases put the machinery in motion) had run down, the impulsion communicated to the vessel by the steady and undisturbed motion of the duck's-foot paddles was sufficient to keep the vessel moving 150 feet more. The report of these experiments by the committee of the Institute is highly favourable."—A plan of a paddle-wheel, on precisely the same plan, was exhibited at one of the meetings of the Institute of Civil Engineers last summer by Henry Vint, Esq., of Colchester, the patentee of the bridle-paddle; and, if we mistake not, a drawing of it was deposited at the time, in the library of the Institution, and may still be consulted there.

Dr. Lardner's Steam-engine illustrated.—We have to apologise to our esteemed correspondent, " Trebor Valentine," for having overlooked his last communication, exculpating himself from the charge of " mis-reading" and " mis-quoting," brought against him by " Vulcan," at page 594. We had not the first number of the work at hand to refer to at the moment and the matter escaped our subsequent attention. We have now to state, that we have seen the edition referred to of Dr. Lardner's work, and that " Trebor Valentine's" quotation *is quite correctly given.* " Vulcan" seems to have overlooked the circumstance of " the seventh edition" only being called in question, and must take back to himself the designation of " *a most careless critic.*"

Errata.—Page 573, 1st column, 15th line from top, for " has been understood," read " has been underrated." Same page, 2nd column, 23rd line from top, for " connecting rod axis of the cylinder," read " connecting rod and axis of the cylinder." Page 588, 2nd column, supply the following line:—" provision on the part of man. The pre-". Page 592, 1st column, 3rd line from bottom, for " but now selected," read " but now patented."

END OF THE THIRTY-THIRD VOLUME.

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